



# BRIDGER BOWL SUPPLEMENTAL DEIS

April 2004



Gallatin National Forest  
Bozeman Ranger District

Persons expressing an interest or submitting comments shall provide the following information, which will become a matter of public record:

- Name and address
- Title or the document for which comments are being submitted (Bridger Bowl SDEIS)
- Specific facts or comments along with supporting reasons that you believe the Responsible Official should consider in reaching a decision

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record (as noted above) on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to 7 CFR 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied, the agency will return the submission and notify the requester that the comments may be resubmitted with or without name and address within 10 days.

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**SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT  
FOR THE BRIDGER BOWL SPECIAL USE PERMIT AND  
MASTER DEVELOPMENT PLAN**

Gallatin National Forest  
Bozeman, Montana  
April 2004

**Lead Agency:** USDA Forest Service

**Responsible Official:** Becki Heath, Forest Supervisor  
Gallatin National Forest

**For Further Information**

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Bozeman Ranger District  
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**Important Notice:** Reviewers should provide the Forest Service with their comments during the review period. This will enable the Forest Service to analyze and respond to comments at one time and to use the information to prepare the Final Environmental Impact Statement, thus avoiding undue delay in the decision making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and will alert the agency to reviewers' positions and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519.533, 1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after the completion of the Final Environmental Impact Statement, City of Angoon v. Hodel (9<sup>th</sup> circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments should be specific and should address the adequacy of the statement or merits of the alternatives discussed. (40CFR 1503.3)

**Comments:** Comments will be received by the public and other agencies for a period of 45 days following the publication of the Federal Register Notice of Availability of the Draft Environmental Impact Statement.

Send comments to: Bozeman Ranger District  
3710 Fallon St., Suite C  
Bozeman, MT 59718



# BRIDGER BOWL SUPPLEMENTAL DEIS

## Executive Summary



Gallatin National Forest  
Bozeman Ranger District

# **EXECUTIVE SUMMARY**

## **INTRODUCTION**

The Bridger Bowl ski area (Bridger Bowl) is located in Bridger Canyon, approximately 15 miles northeast of Bozeman, Montana (see Figure 1-1). Bridger Bowl, Inc., a non-profit Montana enterprise operates the ski area. Bridger Bowl, Inc. currently owns approximately 480 acres on the lower mountain and has a Special Use Permit (SUP) from the Gallatin National Forest (GNF) for use of approximately 1,042 acres of National Forest System (NFS) lands. The Study Area for this analysis includes the current SUP area, those NFS lands proposed for SUP area expansion, and the private lands within and adjacent to the Bridger Bowl; it totals approximately 2,574 acres.

Local Bozeman skiing enthusiasts began using the area in the mid-1940s. The State of Montana negotiated with the local landowner and purchased 120 acres near the base of the Bridger Mountains for access to the national forest and for the proposed State Park and ski area in 1949. Although the plans for a State Park fell through, the local ski enthusiasts organized themselves as the Bozeman State Park Recreational Association (BSPRA) and continued with plans to develop a winter sports area beyond the State land. In 1954, the Forest Service issued the BSPRA a SUP to operate a rope tow and construct a parking area on NFS lands. For the past 50 years, Bridger Bowl, Inc. has pursued acquiring lands in the base area and has used this property to construct parking lots, base lodges, a ski patrol building, and ski terrain for beginners and novice skiers. The area has grown from one rope tow to eight lifts (including one surface lift reserved for ski patrol access to the ridge), 69 developed skiing trails, and two day lodges, with another lodge under construction in 2003 that is scheduled to open in 2004.

## **RELATION OF THE PROPOSED ACTION TO PREVIOUS NEPA**

A draft Environmental Impact Statement (DEIS) for the Bridger Bowl Special Use Permit Renewal and Master Development Plan Update was prepared by the Forest Service in 1998 to and distributed for public comment in April 1999. It provided analysis of the effects of expanding the SUP boundary to the north and south, amending relevant Forest Plan Management Area prescriptions to conform to the proposed SUP expansion, and approving the revised Bridger Bowl Master Development Plan (MDP). Based upon review of the numerous comments received by the public and the need for new or revised analyses of resources (e.g., Threatened, Endangered, or Sensitive species; old growth forest; and additional analysis of cumulative effects), the Forest Service determined that the preparation of a Supplemental DEIS (SDEIS) would be the most effective way to present new information and respond to public comments on the DEIS. This SDEIS supercedes and replaces the 1999 DEIS, and includes changes to the proposed project elements that have taken place since the 1999 DEIS (Table 1.2-1). Many of the issues raised during the comment period for the 1999 DEIS have been incorporated into this SDEIS. In addition, new topography information and new, more accurate GIS methods have been used for the analysis in this SDEIS. A summary of public comments received on the DEIS is included in this document as Appendix B.



**Table 1**  
**Summary Comparison of Proposed Action Elements**

<b>1999 DEIS Project Proposal</b>	<b>2003 SDEIS Project Proposal</b>
Renew SUP	Not required, SUP renewed in 2002 with existing boundary with a reduction of the west boundary
Expand SUP boundary on north and south, reduce boundary on the west to the ridge	Expand SUP boundary on north and south
Change designation of lands to MA 2 on north side of existing SUP (Bradley Meadows) and establish MA 2 on currently undesignated areas	Same
Construct seven new lifts, remove one lift and replace one lift	Construct six new lifts, remove one lift, replace one lift, and modify two lifts
Develop 22 new ski runs; plus N-8 access trail	Develop 16 ski trails; including N-8 access trail
Construct 4 new roads and relocate Bohart Ranch Trail, "Good Clean Fun"	Construct 1.8 miles of new roads (eight segments to proposed lifts and one to Limestone Chalet). No need to relocate Bohart Ranch Trail, "Good Clean Fun"
Expand Snowmaking from 10 to 27 acres	Snowmaking expansion completed, currently 27 acres of snowmaking coverage

Since the 1999 DEIS was issued, some construction activities have taken place at Bridger Bowl, both on private Bridger Bowl property and NFS lands. The Forest Service issued a new SUP to Bridger Bowl for operations within the existing SUP boundary in November 2002 under the authority of National Forest Ski Area Permit Act of 1986 (16 U.S.C 497b). This permit issuance did not constitute a major federal action under the terms of the National Omnibus Parks and Public Lands Management Act of 1996 (16 U.S.C 497c); however, one of the requirements of the new SUP is to have an accepted MDP on file. Bridger Bowl submitted a revised MDP to the Forest Service to fulfill this requirement; the accepted MDP is dated February 2002. The new SUP includes an adjustment to the western boundary of the Bridger Bowl SUP 50 feet west of the ridge line to accommodate Inventoried Roadless Areas. The 136-acre parcel that is now excluded from the SUP area was designated MA12 and has been appended to the GNF Forest Plan. The area of the Bridger Bowl SUP area has been issued for 1,042 acres as a result of this SUP area adjustment.<sup>1</sup> This SUP boundary adjustment of approximately 100 acres was discussed in the 1999 DEIS.

Since 1995, Bridger Bowl has completed several projects on both private and public lands to improve the existing conditions and meet the demands of today's skiers. On private lands, Bridger Bowl had parking lots designed and constructed to meet the Bridger Canyon Zoning Ordinance requirements. They have also completed the installation of a new wastewater treatment system, under the jurisdiction of Montana Department of Environmental Quality. A

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<sup>1</sup> The current SUP indicates that the permit area is 1,042 acres; however, GIS analysis more accurately indicates the actual area of the SUP is 1,122 acres. The permitted SUP area (1,042 acres) is used throughout the text portions of this SDEIS, while the GIS-derived SUP area (1,122 acres) is used for all GIS analysis and data tables within this SDEIS.

new Ski Patrol building has been constructed on private lands adjacent to the Jim Bridger Lodge in November 2002. Construction of a new 35,629 square foot new Day Lodge began in the summer of 2003 and is scheduled for completion in 2004. Also, a beginner lift (Snowflake) was constructed on private lands adjacent to the lower portion of the Virginia City lift in the summer of 1999.

Over consecutive summers from 1998 to 2003, additional snowmaking lines were installed near the Virginia City Lift expanding the snowmaking coverage from 10 acres to 27 acres to allow for more reliable early season openings and to improve the quality of the skiing experience for beginners. The volume and timing of water withdrawals were not changed from conditions before the snowmaking expansion, and as such, water rights and instream flows were not affected (Bridger Bowl Management, 2003). All of these activities have occurred on private lands; however, the cumulative effects of these projects are included in this SDEIS.

The Powder Park Lift provides an access route for skiers accessing the Alpine and Bridger lifts and was designed to compensate for the shortening of the Alpine lift in 1995. The patrol surface lift (P-1) was replaced with a new platter lift, with no change to the ski patrol only access policy. This project was approved by the USFS as part of the 2000 summer construction plan. In 2001, the Pierre's Knob lift was replaced with a fixed grip triple chair to reduce lift lines and the unloading area was graded to allow for easier access for lower ability skiers.

In addition to projects and activities that have occurred at Bridger Bowl since the release of the 1999 DEIS, changes to the proposal have occurred as a result of new information and in response to public comments received on the 1999 DEIS; this is pertinent primarily to the Bradley Meadows portion of the analysis area. The options described in the 1999 DEIS for the N-1 and N-2 lifts have been reviewed and consolidated into a single lift line (identified as N-1 in this SDEIS). One ski run has been eliminated from the Proposed Action and three others have been removed from connected or reasonably foreseeable actions. Furthermore, the N-3 lift, described in the 1999 DEIS, has been eliminated. These project elements have been eliminated from the original proposal due to changes in other projects beyond the scope of this proposal (i.e., 360 Ranch). As a result, these projects are not included in this SDEIS; they are not proposed or under consideration by any known agencies at this time.

## **PURPOSE AND NEED**

The Forest Service and Bridger Bowl management worked cooperatively to develop the purpose and need for this proposal. The overall purpose of the projects within the Bridger Bowl Master Development Plan Update 2002 is to improve the current recreation experience at Bridger Bowl, and address the expected growth in skier visits over the 40-year duration of the SUP in a financially sound manner.

Over the past 50 year operational period of Bridger Bowl, the ski area has seen increases in annual skier visits, with annual skier visits growth reflecting the growth in population in the region. This growth in annual skier visits is affected by the amount and timing of snowfall among other factors.

While the regional population has increased, other regional ski areas that compete with Bridger Bowl have expanded. Despite the increased number and size of the competition, Bridger Bowl continues to attract a high percentage of local skiers, and guests often experience crowded conditions in lift lines and on popular ski trails during busy periods.

Prior to the expansion of the parking and current expansion of the base area facilities, Bridger Bowl visitors regularly found crowded conditions in the parking and lodge facilities. These crowding conditions resulted in decreases in the largest single day (peak day) skier visits. Previous Bridger Bowl MDPs indicated the need for expanded base facilities; focus group studies conducted by Bridger Bowl in 1999 reconfirmed the need for improved facilities and “uncrowded” skiing.

Three needs must be met to achieve this overall purpose: 1) continue to provide uncrowded skiing by better accommodating high demand periods, 2) provide for new trails and lifts to retain existing skiers and attract new skiers by providing terrain variety and a range of trails for all ability levels, and 3) accommodate anticipated growth while maintaining the desired uncrowded slope conditions.

**Need 1: To continue to provide uncrowded skiing by better accommodating high use periods.**

*Background*

The current Comfortable Carrying Capacity (CCC) for lifts and terrain at Bridger Bowl is 3,200 skiers. On peak days, which are typically comprised of weekends, holidays, and big snow days, Bridger Bowl has observed up to 4,525 skiers. More routinely, the resort sees high use days of 3,500 skiers. On these days, guests often experience full parking lots, long lift lines, crowded slopes, and congested skier service facilities.

Skier focus group surveys, conducted by Bridger Bowl, indicated that a high quality recreation experience includes uncrowded slopes, a variety of slopes and terrain, low prices, and access to ridge skiing (Bridger Bowl Focus Group Study, 1999). Due to the close proximity of the ski area to Bozeman and the high number of local skiers, Bridger Bowl experiences high weekend and low midweek skier utilization levels. This utilization pattern tends to create a more expensive and inefficient resort operation, in that the ski area infrastructure realizes low utilization midweek. The current use pattern also results in the perception of crowded weekends at the resort. Although skier visitation continues to increase annually, peak day visitation has decreased since 1995. The reduction in the quality of the recreation experience has had a direct effect on visitation patterns and an indirect effect on the economic viability of the resort.

On-slope congestion is partially controlled by lift capacity; the lift only delivers a certain number of persons per hour despite high demand. Under peak conditions, the length of time and number of people in the lift line expands to unacceptable levels. Increasing lift capacity, without terrain expansion, would increase skier density above current levels and not address issues of amount and variety of terrain.



A second crowding condition occurs during periods of high snowfall or adverse wind conditions. During this condition, lifts and trails that are below avalanche terrain cannot be opened or have delayed openings until avalanche hazard reduction is accomplished. This means that in a highly desirable skiing condition (i.e., good new snow conditions), skiers who wish to utilize the Bridger Lift and Deer Park lifts are diverted to the Pierre's Knob and to a lesser degree, the Alpine lift. The diversions create long lift lines, sometimes in excess of three times the lift ride time (Bridger Bowl Management, 2003). This condition also causes more advanced, faster skiers to utilize terrain more used by lower ability level skiers, creating the potential for skier conflicts on limited terrain.

### *Focus*

Reducing skier congestion at the base of lifts and on existing trails could be accomplished via the expansion of skiable terrain at Bridger Bowl, installation of new lifts, and modification of existing lifts. Expansion of skiable terrain would create more areas in which people could ski and help better distribute skiers across the mountain. Installation of new lifts would serve the new terrain in the expansion areas and increase access to existing ski terrain along the ridge, which is currently accessible only by foot. New lifts, located in areas of reduced avalanche potential, could distribute skiers better and reduce the mixing of different ability level skiers during times of snow safety concerns. Modification of some of the existing lifts within the SUP would improve skier circulation among lifts near the Deer Park Chalet.

**Need 2: To provide new trails and lifts to help retain existing skiers and attract new skiers by providing a range of trails for all ability levels and terrain variety.**

### *Background*

Bridger Bowl has seen modest development over the past eight to ten years, with projects on both private and NFS lands designed to improve the recreation experience and better meet skier demands. In contrast to Bridger Bowl's modest development over the past eight years, Big Sky (45 miles from Bozeman) has developed 13 new lifts in the past 10 years (Big Sky Resort; website; November, 2003). Moonlight Basin, adjacent to Big Sky (47 miles from Bozeman) opened with four lifts as an independent ski area (Moonlight Basin website, December 2003). The Discovery Ski Area (134 miles from Bozeman) has added three new lifts since 2002 with three new trails in 2003 (Discovery Ski Area website, November 2003). Expansion of lifts, trails and facilities has also take place at Red Lodge Mountain Resort in Red Lodge, Montana and Big Mountain Ski and Summer Resort in Whitefish, Montana. A new ski area named Blacktail Mountain near Kalispell, Montana also opened recently.

### *Focus*

Bridger Bowl could expand the amount and variety of skiable terrain available by incorporating the Slushman Drainage and Bradley Meadows areas into its SUP. The Slushman Drainage has already been allocated for winter sports (ski area) by the Forest Plan. Bridger Bowl could also provide increased access to existing ski terrain within the SUP area. Opportunities for expansion would create additional ski terrain for intermediate, advanced, and expert skiers as well as

provide a diversity of terrain at the resort. Additional lift service to the ridge would also enhance access to unique ski terrain within the existing SUP area.

### **Need 3: To accommodate anticipated growth in visitation at Bridger Bowl.**

#### *Background*

Skier visits have increased by approximately 1.5 percent per year over the past 15 seasons (Bridger Bowl Management, 2003). Similarly, average annual growth in Gallatin County/Bozeman has been approximately 1.6 percent (Greater Bozeman Area Transportation Plan; Bozeman Transportation Coordinating Committee, 2001). Due to the strong connection between the community and the ski area, increases in skier visitation are directly tied to population growth.

As stated previously, the lift and terrain CCC for Bridger Bowl is 3,200 skiers. Using the population growth rates identified above, and a similar relationship between annual skier visit growth and population growth, Bridger Bowl will need to accommodate to 4,500 skiers, with an ability to handle peak days of up to 6,000 within the next 10 years.

Some of this expansion has taken place in the parking and skier services areas after 1999, so that the capacity of the guest services is 5,400 skiers. With completion of the base area improvements, parking congestion has been reduced, and facility congestion will be reduced upon completion of the new day lodge.

#### *Focus*

Accommodations for anticipated growth in the market could be accomplished via the expansion of skiable terrain and by providing increased access to existing ski terrain within the SUP area. Opportunities for expansion would create additional ski terrain for intermediate, advanced, and expert skiers as well as providing a diversity of terrain at the resort. Upgrading some of the existing lifts, as well as installing new lifts, would increase uphill capacity to service new and existing terrain. Providing lift service to the public to the ridge would enhance access to unique ski terrain within the existing SUP area.

## **SUMMARY OF THE PROPOSED ACTION**

### **Lifts**

- Modify or replace in existing alignment Bridger and Deer Park lifts
- Remove Alpine Lift
- Construct six new lifts (P-2 and P-3 surface lifts; and S-1, A-1, A-2, and N-1 chairlifts)

### **Trails**

- Expand SUP area into Slushman Drainage (337 acres) and Bradley Meadows (274 acres)
- Construct 16 new trails (96 additional acres of developed ski terrain)

## **Mountain Service Roads**

- Increase mountain road network by 1.8 miles in eight new road segments to facilitate lift construction and maintenance access within the Study Area on both NFS and private lands

## **Utilities**

- Power for proposed project elements would be drawn from existing power lines and would be trenched within existing and proposed mountain service roads

Under the Proposed Action (and other action alternatives) additional development on private lands owned by Bridger Bowl could occur at a later time without a requirement for Forest Service approval or NEPA analysis. Construction of the Limestone Chalet, modification of the Virginia City Lift, and expansion of the parking area are not considered part of Bridger Bowl's site-specific NEPA proposal, but are considered connected actions.

## **SCOPING AND PUBLIC INVOLVEMENT**

A notice of intent (NOI) to prepare an EIS was published in the Federal Register on June 13, 1997. Sixty-six letters were sent, using the GNF mailing list, to federal, state and local government agencies, Native American tribes and groups, and individuals interested in Forest activities. The GNF created an interdisciplinary team (IDT) to coordinate the scoping process within the Forest Service and assist in the development of issues and alternatives in response to the issues raised during the scoping process. Internal scoping involved meetings with IDT members on the Bozeman Ranger District and the GNF. Written correspondence with the USDI-Fish and Wildlife Service (USFWS) identified wildlife species of concern.

This project has been under discussion since 1986. Numerous newspaper articles (Bozeman Chronicle 6-23-91, 10-23-96, 10-24-96, 6-20-97, 6-24-97, Lone Peak Lookout 9-19-97) and local radio interviews have been prepared and conducted for the project at various times over the past 17 years. Several public meetings have also been held to discuss the various past proposals and consultant studies (June 23, 1997 - 3 PM and 7 PM Open House at Bozeman Ranger District offices, Bozeman, MT). A total of 87 letters and telephone calls were received and recorded in response to the initial scoping process. Additional comments were received during the two open houses. A synthesis of comments received during the initial scoping process is included in this document as Appendix A.

## **ISSUES RAISED DURING SCOPING**

The comments received during the scoping process raised issues, concerns, or questions regarding the environmental effects of the project or alternatives. Some issues were identified by the public during the scoping process; other issues relate to resources that are protected by federal and/or state laws or management practices, and as such, they require analysis in the EIS.

From comments received during scoping and the comment period for the 1999 DEIS, issue statements were developed and refined to provide a measurable estimate of the environmental consequences that could result from each of the action alternatives. The intent of the following



issue statements is to clearly identify environmental resources that may be affected by specific activities associated with the implementation of each alternative.

### **Visual Resources**

Existing ski trails at Bridger Bowl are visible from many locations adjacent to the project. Implementation of the Proposed Action would result in the location and construction of additional ski trails. This has the potential to change the existing visual condition as observed from various points, of which Bridger Canyon Road (BCR) was identified as the critical viewing point. Effects to this resource are estimated through comparison of existing visual conditions in the Bridger Bowl study area against impacts of alternative implementation.

### **Roadless**

About 101 acres of the proposed expansion into the Slushman drainage basin to the south would be within the Bridger Bowl Roadless Area #1534. Effects to this resource are estimated through comparison of existing roadless characteristics (i.e., Natural Integrity, Natural Appearance, Remoteness, Solitude, and Special Features and Boundary Management) against expected impacts of alternative implementation.

### **Watershed**

The Proposed Action has the potential to affect water quality and quantity. Existing water quality may be affected by surface and subsurface ground disturbance. These disturbances may include construction of parking areas, ski trails, access roads, and area operations such as increased demands on water and the sewer/septic system. Flow regime and channel morphology may be affected by these disturbances, which could alter the hydrologic response of the watershed. Water quality effects have been estimated by comparing existing sedimentation and water quality in surface and subsurface water resources to the condition under the developed condition. Water quantity effects have been estimated through the use of computer models and professional interpretation of the modeled effects under the developed condition in the SDEIS.

### **Wildlife**

The Proposed Action has the potential to affect Threatened, Endangered, Proposed, Sensitive, and/or Management Indicator species. Habitat removal from the installation of chairlifts and the construction of ski trails may negatively affect the viability of species within Bridger Bowl study area. Effects on wildlife habitat are estimated through analysis of survey information and comparison of the existing wildlife habitat to wildlife habitat under the developed condition. Effects on wildlife disturbance are estimated by comparing existing use of Bridger Bowl and the disturbance regime to the anticipated condition after development.

### **Fisheries**

The Proposed Action has the potential to affect habitat for aquatic species in the South Fork of Brackett Creek, which is inhabited by Yellowstone cutthroat trout and other species. Effects have been estimated through comparison of the existing aquatic habitat conditions to the anticipated conditions after development and how habitat changes would affect these species.

## **Wetlands**

Several small wetlands occur in or near the project area. The Proposed Action has the potential to affect the wetlands by construction or operation activities. Effects to wetlands are estimated through comparison of the existing area and function of wetlands against the effects of development on the area and function of wetlands.

## **Recreation/User Conflicts**

The proposed expansion of the SUP boundary may block access to or result in a loss of backcountry skiing and snowboarding terrain. Effects will be estimated through comparison of the existing capacity and economics of the ski area to the developed condition. Effects to backcountry and Nordic skiing have been estimated in the SDEIS by comparing the existing opportunities for these activities to the opportunities available under the developed condition.

## **ADDITIONAL ISSUES RAISED DURING THE DEIS PROCESS**

Additional input on the document was received during the comment period for the 1999 DEIS; these comments raised issues, concerns, or questions regarding the environmental effects of the project or alternatives that were not clearly addressed or were not included in the 1999 DEIS. Additional issue statements were developed and refined to provide a measurable estimate of the environmental consequences that could result from each of the action alternatives and to include this information in the SDEIS. A more complete summary of the comments received during scoping is included as Appendix B in this document.

## **Purpose and Need**

The document needs to better support the purpose and need to expand the ski area beyond its existing boundaries.

## **Recreation**

Dispersed recreation and access to public lands needs to be described in more detail in the document. Additionally, ski area capacity across the alternatives should be described more clearly. Lastly, snowmobile use within the area needs to be addressed.

## **Socio-Economic Resources**

The issue of Environmental Justice was not outlined in the document; there are potential effects to minority and low-income populations as a result of this proposal.

## **Noise**

The document should describe current noise levels and anticipated effects as a result of the proposal.

## **Safety**

The document should describe more clearly about issues of safety including skier safety, transportation and road safety, and emergency services.

## **Watershed Resources**

The document should describe the anticipated road density at Bridger Bowl. It should also include a map of affected watersheds as well as disclose impacts to wetlands.

## **Vegetation**

The document needs to describe the potential for noxious weeds to invade the project area as a result of construction. It should also describe effects to white bark pine.

## **Wildlife and Fisheries**

There is no documentation of correspondence with the US Fish and Wildlife Service in the document. Additional surveys are requested for the boreal owl, wolverine, flammulated owl, and goshawk. Impacts to the Yellowstone cutthroat trout need as a result of increased snowmaking need to be more clearly defined.

## **Cumulative Effects**

The document inadequately describes cumulative effects, particularly any reasonable foreseeable actions.

## **ALTERNATIVES CONSIDERED BUT ELIMINATED**

### **Removal of P-2 Lift and Construction of a Shortened Slushman Lift to Avoid Impacts to Inventoried Roadless Areas (IRAs)**

This alternative was identified to consider the effects of the reducing the lift system in the Slushman area, avoiding potential impacts to IRAs. The description of the current Proposed Action already indicates that no roads would be constructed to the proposed P-2 lift in the IRAs, and other impacts of the skiing and lifts are illustrated in the action alternatives. This alternative would not meet the project Purpose and Need for a lift system in the Slushman area for access to the ridge for avalanche control.

### **Increased Ski Area Capacity through Facility Upgrades within the Existing Ski Area, No SUP Expansion**

This alternative was identified to assess the possibilities of expansion of facilities within the current ski area boundary. At the time of the 1999 DEIS, facilities were limited in the base area and in the ski terrain in general. Base area capacities have been increased on private lands to meet growing demand. To increase capacity for future demand and reduce existing congestion in the ski terrain, additional lift capacity could be developed; however, additional lift capacity within the existing SUP area would increase the number of persons on a ski trail, thus increasing skier density on existing trails. As a result, this alternative would not meet the Purpose and Need of maintaining “uncrowded” conditions.



### **Construction of the Ridge Access Lift P-2 further to the South above the Proposed Slushman Lift**

This alternative was considered to reduce impacts of P-2 lift construction on the ridge area and responded to the issue of skier safety, which was raised during the scoping process. This alternative was not studied in detail in the 1999 DEIS because of avalanche safety concerns in the southern portion of the Slushman Bowl area and the cliff areas adjacent to the bowl. However, after comments to the 1999 DEIS were received, further study was completed in the Slushman Bowl. The alignment proposed in this SDEIS was found to better address previous construction and avalanche concerns, as well as skier circulation concerns.

### **Construction of Ridge Access Lift P-2 without Public Access**

This alternative was developed to address public concerns regarding additional ridge access by the public, which affects ski quality and safety. The P-2 lift would be constructed, but access would be restricted to ski patrol for snow safety operations. Impacts to physical and biological resources from this alternative would be the same as the Proposed Action. Because of the similarities of this Alternative to others carried forward, this alternative was not analyzed in detail.

### **Construction of the Slushman Lift without the Ridge Access Lift P-2**

This alternative would allow the lift and trail development in the Slushman drainage to meet the Purpose and Need for additional diverse terrain, but would not allow for the construction of the P-2 lift. This alternative was considered in response to the issue of increasing terrain in the Slushman area while limiting public access to the ridge. Access to the ridge would continue to be allowed for hike-to backcountry skiers. Avalanche safety would continue as currently managed. This alternative was not studied in detail because it would have been difficult for the ski patrol to access the ridge above the proposed Slushman lift and ski terrain in a timely manner for adequate avalanche hazard reduction work, and the impacts to resources would be very similar to the Proposed Action since no tree clearing would be required for trails servicing the P-2 lift.

### **Construction of a Chairlift to the Ridge**

This alternative considered an aerial chairlift, rather than a surface lift to the ridge to reduce possible resource impacts, responding to vegetation and wildlife issues raised during scoping, and to make skier access to the ridge easier. This alternative was not analyzed further due to the lack of sufficient area at the proposed top terminal for skier unloading without major earthwork on the ridge. Additional concerns included the additional capacity the lift would provide to the ridge, as well as user safety due to high wind on the ridge.

### **Expansion of the Ski Area Permit for the Slushman and Bradley Meadows Areas without Lifts**

This alternative was developed to address the concern of increasing lift-served skiing outside of the current SUP area by allowing the expansion of the SUP area without the construction of lifts.

The proposed expansion areas would be accessed by hiking along skier access trails. This alternative was not studied in detail because of snow safety concerns and skier evacuation concerns. Additionally, this alternative did not meet the Purpose and Need for the project, which includes the expansion of lift served skiing opportunities in order to better serve the public demand for less crowded conditions at Bridger Bowl.

## **ALTERNATIVES CONSIDERED IN DETAIL**

### **Alternative 1**

Under Alternative 1, there would be no change to the existing SUP or its boundaries, and Bridger Bowl would continue to operate under the conditions of the 40-year SUP that was issued by the Forest Service in November 2002. The existing lifts, ski trails, and facilities at Bridger Bowl would also be maintained in their current condition under Alternative 1. The overall resort CCC of Bridger Bowl would remain unchanged at approximately 3,200 skiers as limited by the capacity of the lifts and terrain. The guest services capacity under existing conditions is 5,400; this is limited by the capacity of the wastewater treatment system and will not change upon completion of the new day lodge. Under Alternative 1, there would be no additional effects on the biological or human environment resulting from development of new facilities. Implementation of Alternative 1 would not meet the Purpose and Need for the Proposed Action; however, it must be analyzed to provide a baseline by which to compare the environmental consequences of the action alternatives. Refer to Figure 2-1 for a graphic representation of Alternative 1.

#### *Lifts*

Under Alternative 1, Bridger Bowl would continue to operate eight ski lifts. Any future lift replacements on NFS lands would require project-specific NEPA analysis and approval from the Forest Service.

#### *Trails*

The existing terrain at Bridger Bowl would be maintained under Alternative 1, including 69 named trails that provide approximately 407 acres of developed ski terrain. The existing trail network would continue to accommodate a range of skier abilities from beginner to expert. It is comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 57.6 acres of low-intermediate terrain, 113.6 acres of intermediate terrain, 55.7 acres of advanced-intermediate terrain and 81.5 acres of expert terrain.

#### *Mountain Service Roads*

Under Alternative 1, Bridger Bowl would continue to operate its existing network of mountain service roads. The Bridger Bowl Study Area contains approximately 16 total miles of roads on NFS lands, Bridger Bowl private lands, and other private lands. Of this total, 8.6 miles are on NFS lands. No new road construction or obliteration projects would occur. Any future road construction or obliteration projects on NFS lands would require specific Forest Service approval.

## *Support Facilities*

No new guest service facilities would be constructed on NFS lands under Alternative 1; however, construction of the new day lodge in the base area would continue.

## **Alternative 2**

Alternative 2 is the Proposed Action as detailed in the 2002 Bridger Bowl MDP. If Alternative 2 is selected by the Forest Service, the 2002 Bridger Bowl MDP would be approved and would serve as the guidance document for the life of the SUP. Under Alternative 2, the guest services capacity would increase to 6,200 upon completion of the Limestone Chalet. However, the capacity of the lifts and terrain would only increase to 6,100, thus limiting the overall resort CCC of Bridger Bowl to 6,100.

In addition, the Bridger Bowl SUP boundary would be expanded to the north by 274 acres to include the Bradley Meadows area above the South Fork of Brackett Creek. The SUP boundary would also be expanded to the south into the Slushman Drainage area for an additional increase of 337 acres. In all action alternatives, the southeast portion of the SUP area would be adjusted to include the gun tower that Bridger Bowl currently uses for avalanche control work within their SUP area. This boundary adjustment would result in a net increase of 45 acres<sup>2</sup> to the Bridger Bowl SUP area. Refer to Figure 2-3 for a graphic representation of Alternative 2.

## **Connected Actions**

Under all action alternatives, additional development on private lands owned by Bridger Bowl could occur at a later time without a requirement for Forest Service approval or NEPA analysis. For purposes of disclosure, these project elements are described here and the effects of these connected actions are described in Chapter 3; however, they are not considered part of Bridger Bowl's site-specific NEPA proposal.

The portion of the Virginia City Lift located on private land is proposed for modification within its existing alignment. Bridger Bowl would shorten the length of the lift line and relocate the bottom terminal uphill to reduce congestion in the base area.

In addition to completion of the new day lodge, the Limestone Chalet is proposed on private lands at the base of the proposed N-1 lift. The Limestone Chalet would be 4,151 square feet in size and would provide 180 additional restaurant seats and 50 deck seats. At a turnover rate of 3.7 people per seat, the Limestone Chalet would accommodate approximately 800 people per day with necessary infrastructure, including an on-site septic system.

An additional 1.5 acres of parking would be constructed adjacent to the existing parking lot on private lands in the base area. The additional parking lot would bring Bridger Bowl parking

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<sup>2</sup> The proposed adjustment to the Bridger Bowl SUP area in the vicinity of the gun tower would result in a net increase of 45 acres to the SUP area. This is due to minor adjustments along this edge of the boundary, including the removal of approximately 16.7 acres from the current SUP area and the addition of approximately 61.4 acres for the inclusion of the gun tower. Refer to Figure 2-4 for additional information.

areas to design capacity as governed by Bridger Canyon zoning restrictions. Although the parking would be constructed on private land, new lots would have a native or gravel surface and be built with appropriate erosion control and drainage provisions.

### *Lifts*

Under Alternative 2, Bridger Bowl would operate a total of 13 ski lifts, including 10 chairlifts and three surface lifts (see Figure 2-3). Bridger Bowl would increase the capacity of the lifts and terrain, as demand warrants, from 3,200 to 6,100. Two existing chairlifts would be modified or replaced in their existing alignments; Bridger and Deer Park chairlifts. The Alpine chairlift would be removed, and six new lifts would be constructed; P-2 and P-3 surface lifts; and S-1, A-1, A-2, and N-1 chairlifts.

Bridger Bowl would increase lift and trail capacity as demand warrants, therefore the development projects may be delayed in response to demand and financial considerations.

### *Trails*

Alternative 2 proposes the development of additional ski terrain in both the Bradley Meadows and the Slushman Drainage expansion areas. This would entail the creation of 16 new trails (S-1 through 7 and trails N-1 through 9). Under Alternative 2, the Bridger Bowl trail network would increase by approximately 96 acres to 85 trails on approximately 503 acres. The trail network would accommodate the entire range of skier abilities from beginner to expert, comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 58.6 acres of low-intermediate terrain, 120.5 acres of intermediate terrain, 66.3 acres of advanced-intermediate terrain, and 159 acres of expert terrain.

The 16 proposed trails would be constructed according to the Clearing with No Grading and the No Construction Activities construction techniques described above and displayed graphically in Figure 2-2. Timber removal techniques would be consistent with Forest Service Standards and Guidelines. Trail alignments would follow natural fall lines to the greatest extent possible. Edges of the trails would be irregular to simulate natural forest openings consistent with providing a quality skiing experience and meeting visual quality objectives.

### *Mountain Service Roads*

Under Alternative 2, the road network within the study area would increase to a total of 17.7 miles, with 1.4 miles of new road proposed on NFS lands and 0.4 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. In total, eight new road segments would be constructed to facilitate lift construction and maintenance access. Two new road segments would be constructed to the top of the proposed A-2 and N-1 chairlifts, five road segments to the bottom of N-1 (on private lands), A-1, A-2, P-3 and S-1 chairlifts, and one road segment to the bottom of the Limestone Chalet on private land. The roads would meet Forest Service standards.

## *Utilities*

The increase in on-mountain guest services capacity would be accommodated by the existing wastewater treatment system plus the on-site septic system at the Limestone Chalet; together they would accommodate 6,200 skiers per day. Power for proposed project elements, including the new lifts, would be drawn from existing power lines currently installed for power to chairlifts on existing terrain and would be trenched within existing and proposed mountain access roads. Additional power, domestic water, and wastewater treatment would be necessary for completion of the Limestone Chalet on adjacent private lands.

## *Forest Plan Direction and Consistency*

Alternative 2 would require several amendments to the GNF Forest Plan to create and/or maintain consistency with management direction. These four proposed amendments are summarized below and detailed in Appendix C.

- Change the management area designation in the Bradley Meadows area (217.3 acres) from MA 12 (with an emphasis on dispersed recreation and big game habitat) to MA 2 (with an emphasis on winter sports areas). Section 13 was acquired by the Forest Service in 1993 through a land exchange; this area currently has no management area designation. In addition to the change above, approximately 57 acres would also be allocated to MA 2 (Marlenee, 1999). The remainder of Section 13 would be designated to MA 12 to maintain habitat integrity.
- In conjunction with the SUP adjustment for the inclusion of the gun tower, change MA designations along the proposed southeast SUP boundary from MA 11 to MA 2 to ensure that all lands within the SUP area are designated MA 2. This would result in approximately four acres changing to MA 2. Approximately 17 acres would be removed from the SUP area and re-designated MA 11 as part of this proposal.
- In conjunction with the change in management area designation from 12 to 2, the Visual Quality Objective (VQO) for the Bradley Meadows area would also be amended to be consistent with MA 2 direction. As a result, the VQO for this area would change from *Retention* to *Partial Retention*.
- The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and generally encompass an area representative of elk summer range. It requires an HEI rating of at least 0.70. The Proposed Action includes timber compartments 504 and 515. Compartment 504 currently has an HEI of 0.54, while compartment 515 currently has an HEI of 0.50. The HEIs for timber compartments 504 and 515 are both below the minimum standard of 0.70 established in the Forest Plan. While road density would increase within the Study Area, it would not substantially alter the current HEI for compartment 504 or 515; however, a Forest Plan amendment is

required to address the current substandard condition and enable the Proposed Action to be consistent with management direction.

- In timber compartment 504, the existing area of old growth is currently below the Forest Plan standard of 10 percent; current conditions only display 7.0 percent old growth within the compartment. Implementation of the Proposed Action would further reduce the percentage of old growth within the compartment from seven to 6.95 with construction of the project elements associated with the N-1 Lift and N trails.

### **Alternative 3**

Alternative 3 was developed by the Forest Service to reduce impacts to the Bridger IRAs surrounding Bridger Bowl by eliminating development in the Slushman Drainage area. None of the projects proposed under Alternative 3 would occur in the roadless area. Under Alternative 3, the guest services capacity for Bridger Bowl would increase from 5,400 to 6,200. The SUP area would be expanded by 274 acres to the north to include the Bradley Meadows areas. Expansion of the SUP area into the Slushman Drainage would not occur. The remainder of the project elements under Alternative 3 would be as described under Alternative 2. Refer to Figure 2-5 for a graphic representation of Alternative 3.

#### *Lifts*

Four new lifts would be constructed under Alternative 3; one surface lift (P-3), and three chairlifts (A-1, A-2, and N-1) for a total of 11 lifts. Bridger Bowl would increase the capacity of the lifts and terrain, as demand warrants, from 3,200 to 5,600. The Deer Park and Bridger lifts would be modified or replaced within their existing alignments. Under Alternative 3, the S-1 and P-2 lifts would not be constructed because there would be no expansion into the Slushman Drainage.

#### *Trails*

Alternative 3 proposes the development of nine new trails in the Bradley Meadows area. This would expand the developed trail network by approximately 52 acres for a total of 459 acres. The proposed trail network would have 78 developed trails, which would accommodate the entire range of skier abilities from beginner to expert. This would be comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 58.6 acres of low-intermediate terrain, 120.5 acres of intermediate terrain, 66.3 acres of advanced-intermediate terrain, and 114.4 acres of expert terrain.

#### *Mountain Service Roads*

Under Alternative 3, the road network within the study area would increase to a total of 17 miles, with 0.8 miles of new road proposed on NFS lands and 0.3 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. Seven new road segments would be constructed to facilitate summer lift construction and maintenance access. Two new road segments would be constructed to the top of the proposed A-2 and N-1 chairlifts, four road

segments to the bottom of N-1 (on private lands), A-1, A-2, and P-3 chairlifts, and one road segment to the bottom of the proposed Limestone Chalet. The roads would meet Forest Service standards.

### *Support Facilities*

The guest support facilities at Bridger Bowl would be the same under Alternative 3 as proposed under Alternative 2. Bridger Bowl would continue to operate the Jim Bridger Lodge and the Deer Park Chalet, as well as the new day lodge once it is completed.

### *Forest Plan*

Alternative 3 would require several amendments to the GNF Forest Plan to create and/or maintain consistency with management direction. These four proposed amendments are summarized below and detailed in Appendix C.

- Change the management area designation in the Bradley Meadows area (217.3 acres) from MA 12 (with an emphasis on dispersed recreation and big game habitat) to MA 2 (with an emphasis on winter sports areas). Section 13 was acquired by the Forest Service in 1993 through a land exchange; this area currently has no management area designation. In addition to the change above, approximately 57 acres would also be allocated to MA 2 (Marlenee, 1999). The remainder of Section 13 would be designated to MA 12 to maintain habitat integrity.
- In conjunction with the SUP adjustment for the inclusion of the gun tower, change MA designations along the proposed southeast SUP boundary from MA 11 to MA 2 to ensure that all lands within the SUP area are designated MA 2. This would result in approximately four acres changing to MA 2. Approximately 17 acres would be removed from the SUP area and re-designated MA 11 as part of this proposal.
- In conjunction with the change in management area designation from 12 to 2, the Visual Quality Objective (VQO) for the Bradley Meadows area would also be amended to be consistent with MA 2 direction. As a result, the VQO for this area would change from *Retention* to *Partial Retention*.
- The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and generally encompass an area representative of elk summer range. It requires an HEI rating of at least 0.70. The Proposed Action includes timber compartments 504 and 515. Compartment 504 currently has an HEI of 0.54, while compartment 515 currently has an HEI of 0.50. The HEIs for timber compartments 504 and 515 are both below the minimum standard of 0.70 established in the Forest Plan. While road density would increase within the Study Area, it would not substantially alter the current HEI for compartment 504 or 515; however, a Forest Plan amendment is

required to address the current substandard condition and enable the Proposed Action to be consistent with management direction.

- In timber compartment 504, the existing area of old growth is currently below the Forest Plan standard of 10 percent; current conditions only display 7.0 percent old growth within the compartment. Implementation of the Proposed Action would further reduce the percentage of old growth within the compartment from seven to 6.95 with construction of the project elements associated with the N-1 Lift and N trails.

## **Alternative 4**

Alternative 4 was developed by the Forest Service to reduce potential impacts to wildlife and old growth forest by eliminating development in the Bradley Meadows area. Under Alternative 4, the guest services capacity for Bridger Bowl would increase from 5,400 to 6,200 as demand warrants with proposed expansions and upgrades, the same as in Alternatives 2 and 3. In addition, the Bridger Bowl SUP boundary would be expanded to the south by 337 acres to include the Slushman Drainage area. Expansion of the SUP area into the Bradley Meadows area would not occur. Refer to Figure 2-6 for a graphic representation of Alternative 4.

### *Lifts*

Similar to Alternative 3, Bridger Bowl would operate 11 ski lifts, including nine chairlifts and two surface lifts under Alternative 4. Bridger Bowl would increase the capacity of the lift and trail system to 5,100. Four new lifts would be constructed under Alternative 4; one surface lift (P-2), and three chairlifts (A-1, A-2, and S-1). The replacement and/or modification of two existing lifts (Deer Park and Bridger) would be as described under Alternative 2. Under Alternative 4, the proposed N-1 and P-3 lifts would not be constructed because there would be no expansion into the Bradley Meadows area.

### *Trails*

Alternative 4 proposes to develop seven new trails in the Slushman Drainage area, which would expand the developed trail network by approximately 45 acres for a ski area total of approximately 452 acres. The trail network would have 76 trails, which would accommodate a range of skier abilities from beginner to expert. This would be comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 57.6 acres of low-intermediate terrain, 113.6 acres of intermediate terrain, 55.7 acres of advanced-intermediate terrain, and 126.1 acres of expert terrain.

### *Mountain Service Roads*

Under Alternative 4, the road network within the study area would increase to a total of 17.1 miles, with 0.9 miles of new road proposed on NFS lands and 0.3 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. In total, five new road segments would be constructed to facilitate lift construction and summer maintenance access. One new road segment would be constructed to the top of the proposed A-2 chairlift, three road segments to the



bottom of A-1, A-2, and S-1 chairlifts, and one road segment to the bottom of the proposed Limestone Chalet. The roads would meet Forest Service standards.

### *Support Facilities*

Under Alternative 4, the guest support facilities at Bridger Bowl would be the same as proposed under Alternative 2. Bridger Bowl would continue to operate the Jim Bridger Lodge and the Deer Park Chalet, as well as the new day lodge once it is completed.

### *Forest Plan*

Only one Forest Plan amendment would be required under Alternative 4; this is relative to the boundary adjustments made to accommodate the gun tower. Approximately 17 acres of land would be removed from the SUP and re-designated MA 11, while another 4 acres would be added to the SUP area and designated MA 2. The remainder of the lands in the proposed Slushman Drainage expansion area is already MA 2, and the current SUP would be amended to expand the SUP to include approximately 337 acres to the south of the existing SUP, within the Slushman drainage basin.

## **SUMMARY COMPARISON OF ALTERNATIVES**

Table 2 presents a summary comparison of the alternatives, while Table 3 compares the environmental consequences of each alternative. A detailed analysis of the environmental consequences of each alternative is presented in Chapter 4 of the SDEIS.

**Table 2**  
**Summary Comparison of Bridger Bowl Facilities by Alternative**

<b>MDP Components</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
<b>SUP area (acres)<sup>a</sup></b>	1,122	1,778	1,441	1,504
<b>Ski Area Capacity (CCC)</b>	3,200	6,100	5,600	5,100
Guest Services Capacity	5,400	6,200	6,200	6,200
Lift and Terrain Capacity	3,200	6,100	5,600	5,100
<b>Lifts</b>				
Total Number of Lifts	8	13	11	11
<b>Trails</b>				
Total Number of Trails	69	85	78	76
<b>Trail Distribution by Ability Level</b>				
Beginner and Novice (acres)	99	99	99	99
Intermediate (acres)	227	245	245	227
Expert (acres)	81	159	114	126
Total (acres)	407	503	459	452
<b>Roads</b>				
Total miles within study area	15.9	17.7	17.0	17.1
Total miles on NFS lands	8.6	10.0	9.4	9.5
<b>Food Service</b>				
Total Number of Seats	1,430	1,610	1,610	1,610

<sup>a</sup> The SUP states that the permitted area is 1,042 acres in size. Based on analysis of the SUP area using GIS software, the SUP area is 1,122 acres in size. The updated GIS area of 1,122 acres was used in calculations for all proposed project elements.

**Table 3**  
**Summary Comparison of Environmental Consequences within the Study Area**

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Geology and Soil Resources</b>				
<i>Impacts to Soil Resources</i>				
Temporary Soil Impacts (ac.)	0.0	+57.3	+50.0	+19.5
Permanent Soil Impacts (ac.)	62.0	+7.0	+5.3	+5.4
<b>Total Soil Impacts (ac.)</b>	<b>62.0</b>	<b>+64.3</b>	<b>+55.3</b>	<b>+24.9</b>
<i>Sediment Yield to Streams</i>				
SF Brackett (tons/yr.)	89.8	+1.6	+1.6	+0.0
Upper Bridger (tons/yr.)	161.2	+3.5	+3.5	+2.4
Maynard (tons/yr.)	63.7	+2.5	+2.5	+1.3
Slushman (tons/yr.)	100.0	+1.5	+0.0	+1.5
<b>Totals (tons/yr.)</b>	<b>414.7</b>	<b>+9.1</b>	<b>+7.6</b>	<b>+5.2</b>
<b>Water Resources</b>				
<i>Road Characteristics</i>				
Road Network (mi.)	15.9	+1.8	+1.0	+1.1
Road Network Density (mi/mi <sup>2</sup> )	4.0	+0.4	+0.3	+0.3
Perennial Stream Crossings	5	+1	0	+1
Intermittent Stream Crossings	24	0	0	0
<i>Wetland Impacts</i>				
Impacts from Grading(ac.)	0.0	0	0	0
Impacts from Clearing (ac.)	0.0	-0.48	-0.48	0
<b>Total (acres)</b>	<b>0.0</b>	<b>-0.48</b>	<b>-0.48</b>	<b>0</b>
<b>Vegetation (Forest Cover)</b>				
Old Growth Forest Impacts (ac.)	182.9	-17.1	-17.1	-0.1
Mature Forest Impacts (ac.)	603.0	-26.1	-23.1	-7.6
Immature Forest Impacts (ac.)	184.6	-2.6	-0.5	-2.1
<b>Total Forest Cover Impacts (ac.)</b>	<b>970.5</b>	<b>-45.8</b>	<b>-41.3</b>	<b>-9.8</b>
Non-forest Cover Impacts	1,542.7	-13.2	-10.9	-9.5
<b>Total Vegetation Impacts (ac.)</b>	<b>2,513.2<sup>a</sup></b>	<b>-59.0</b>	<b>-51.6</b>	<b>-19.3</b>
<b>Wildlife</b>				
<i>Impacts to T &amp; E Species</i>				
Gray wolf	No Effect	No Effect	No Effect	No Effect
Bald Eagle	No Effect	No Effect	No Effect	No Effect
Grizzly bear	No Effect	No Effect	No Effect	No Effect
Canada lynx	No Effect	Likely to adversely affect lynx habitat.	Likely to adversely affect lynx habitat.	May affect, not likely to adversely affect individuals.
<i>Impacts to R1 Sensitive Species</i>	No effect	May impact individuals of certain species.	May impact individuals of certain species.	May impact individuals of certain species.
<i>Impacts to Game Species</i>	No effect	May impact individuals of certain species.	May impact individuals of certain species.	May impact individuals of certain species.

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Fisheries</b>				
Impacts to Special-Status and T&E Listed Species	No Effect	No Effect	No Effect	No Effect
<b>Inventoried Roadless Areas</b>				
Impacts to IRAs	No Change	New SUP would include 101 acres of the IRA. No new roads would be built, 1.4 acres of trees would be cleared, and 0.7 acres of grading would take place in the IRA.	No Change	New SUP would include 101 acres of the IRA. No new roads would be built, 1.4 acres of trees would be cleared, and 0.7 acres of grading would take place in the IRA.
Impacts to Wilderness Characteristics	No Change	Lift & trails would reduce natural appearance of area. Level of solitude & remoteness would be diminished.	No Change	Lift & trails would reduce natural appearance of area. Level of solitude & remoteness would be diminished.
<b>Air Quality</b>				
	Compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.
<b>Visual Resources</b>				
	Consistent with the VQO of Partial Retention assigned to the SUP area as viewed from BCR.	Expansion of SUP boundary to the north and change from MA 12 to MA 2 in this area would result in a change of VQO designation from Retention to Partial Retention. Consistent with assigned VQO when viewed from BCR.	Expansion of SUP boundary to the north and change from MA 12 to MA 2 in this area would result in a change of VQO designation from Retention to Partial Retention. Consistent with assigned VQO when viewed from BCR.	Would remain consistent with the VQO of Partial Retention assigned to the SUP area as viewed from BCR.
<b>Cultural Resources</b>				
	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.
<b>Socio-Economic Resources</b>				
Environmental Justice	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.

<sup>a</sup> Total vegetation cover does not equal the Study Area size because there are approximately 64 acres of open water and developed land that are not vegetated within this area.

## Mitigation Measures

NEPA and CEQ regulations require identification of all relevant, reasonable mitigation measures that could reduce the impacts of the project, even if those measures are outside the jurisdiction of the Forest Service. Therefore, the following list of mitigation measures are proposed for all of the action alternatives (i.e., alternatives 2, 3, and 4) to minimize and/or avoid impacts to resources or to enhance resource functions. These mitigation measures are specific to this project proposal and would enable implementation of project elements to meet the purpose and need in Chapter 1, while addressing resource issues. These mitigation measures would be incorporated into the project design and be included as permit or contract requirements. Local governments and state and federal agencies may require additional mitigation measures as conditions of permits.

**Table 4**  
**Mitigation Measures**

Reference Code	Mitigation Measure Description
<b>Vegetation Management</b>	
<b>VM-1</b>	Machine harvest or ground based yarding of trees will not occur on slopes greater than 35% unless the soil is frozen and/or covered by more than six inches of snow.
<b>VM-2</b>	Any unplanned skid trails or roads will be approved by the Forest Service prior to construction.
<b>VM-3</b>	To the extent possible, avoid placing any heavy machinery in wetlands. If heavy machinery needs to operate on wetland sites with saturated soils or standing water, provide pads (such as plywood) under the machinery that would be capable of supporting it from sinking into the soil surface.
<b>VM-4</b>	Where tree clearing in wetlands is unavoidable, the shrub component understory will be maintained in order to provide root systems necessary for stability and sediment filtration. Mechanical trimming of shrubs for skier safety would be allowed to the degree that their vigor and survival are maintained.
<b>VM-5</b>	Pre-project surveys will be conducted in and adjacent to areas to be disturbed for any new plant species added to the Forest Service Sensitive Plant Species list after the publication of this document as directed by a Forest Service biologist.
<b>VM-6</b>	Minimize the amount of vegetation manipulation in sensitive areas such as wetlands, stream environments, and important wildlife habitat features. Ski trails should avoid wetlands or cross as little wetlands as possible.
<b>Riparian Area Protection</b>	
<b>RP-1</b>	No tree clearing for ski trail construction is proposed in SMZ under Alternative 2, however one road crossing is proposed. The road will cross the stream as close to perpendicular to the stream as possible. A 310 permit is required from the Gallatin Soil Conservation District for culverts installation in perennial streams.
<b>Revegetation</b>	
<b>RV-1</b>	All disturbed areas that have been regraded and re-topsoiled will be revegetated as soon as possible. All grass seed shall be free from noxious weeds. Seed shall be delivered to the site in sealed containers (bags) with the dealer's guaranteed analysis and blue tagged certification.

<b>Reference Code</b>	<b>Mitigation Measure Description</b>
<b>RV-2</b>	Revegetated areas will be monitored at least every year by Bridger Bowl until the fifth year to ensure that monitoring performance standards are met. Monitoring will include both qualitative and quantitative approaches to assess the success of all runoff and erosion control measures and revegetation efforts. In addition, monitoring will take place after each spring during the peak of the snowmelt cycle (see Appendix D for detailed monitoring guidelines).
<b>Streambank Protection</b>	
<b>SP-1</b>	Human created debris accumulations will be removed from streams to prevent reductions in stream channel stability and capability.
<b>SP-2</b>	Fertilizer application will be minimized in stream management zones (i.e., road or trail crossings). Manufacturer recommendations will be followed for minimum distances from water.
<b>SP-3</b>	Log landing and decking areas will be located out of the stream management zones.
<b>Wildlife</b>	
<b>W-1</b>	Helicopters may not fly above or land on the ridge from September 1 through October 31 to avoid disturbance to migrating raptors unless approved by the Bozeman District Ranger.
<b>W-2</b>	Wolverines and other scavengers may be attracted to human food sources such as garbage, which can result in mortality due to control of nuisance animals. Sanitation measures will be implemented by Bridger Bowl to prevent unwanted wildlife visitations to ski area facilities.
<b>W-3</b>	Due to the change in Management Area designation in the Bradley Meadows area from MA 12 to MA 2, the remaining portion of Section 13 will be designated MA 12 to maintain habitat integrity.
<b>W-4</b>	South Fork Brackett Creek Drainage will be precluded from motorized use to maintain habitat security.
<b>W-5</b>	If construction activities within and adjacent to streams and wetlands are scheduled to occur between June 1 – August 15, pre-construction surveys will be performed by a Forest Service approved wildlife biologist to determine if the streams and wetlands are being used by Boreal toads for breeding and rearing. If Boreal toads are observed appropriate BMPs will be developed by the Forest Service to minimize the potential for construction impacts during the June 1 – August 15 timeframe.
<b>Cultural Resources</b>	
<b>CR-1</b>	The project contractors are required to temporarily halt ground disturbing activities and notify the District Ranger in the event that subsurface cultural evidence or historical sites are encountered during project construction. An archaeologist will determine the significance of the materials and specify mitigation measures.
<b>Air Quality</b>	
<b>AQ-1</b>	All grading areas, including roadways, buildings, and lift terminal areas, will be sufficiently watered to prevent excessive amounts of dust. In the absence of natural precipitation, watering of these areas will occur at least daily with complete coverage.

## **ADDITIONAL MATERIALS INCLUDED**

A list of preparers (Chapter 5) and a list of agencies and other governments involved with the SDEIS (Chapter 6) can be found in the SDEIS. References (Chapter 7), a glossary (Chapter 8), an index (Chapter 9) and four appendices (Appendices A-D) are also included in order to assist the reader in understanding the analysis in the SDEIS.

## **IDENTIFICATION OF THE PREFERRED ALTERNATIVE**

At this time, considering the environmental impacts to public lands and the opportunities for use of those lands that would benefit the most people over the longest term, the Forest Supervisor prefers Alternative 2. Following review of public and agency comments on this EIS, the Forest Supervisor will make a final determination as to which alternative best serves the public interest on National Forest System lands. Modification of the preferred alternative may occur.

## **OPPORTUNITY TO COMMENT**

Comments are encouraged on this EIS and should be provided during the review period of the draft EIS. Comments for the draft EIS shall be accepted for 60 days following the date of publication of the Notice of Availability (NOA) in the Federal Register pursuant to 40 CFR parts 1500-1508 (June 4, 2003). The 60-day comment period will begin on the first day after publication of the NOA.

Comments will be reviewed and addressed prior to making any decision. Comments on the draft EIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

### **Send Written Comments to:**

Bozeman Ranger District  
3710 Fallon St., Suite C  
Bozeman, MT 59718  
phone: (406) 522-2520

Written comments may also be hand delivered during office business hours between 8:00 a.m. and 4:30 p.m. - Monday through Friday, excluding federal holidays.

Oral comments must be provided at the Responsible Official's office during normal business hours via telephone (406) 522-2520, in person, or at an official agency function (i.e., public meeting) that is designed to elicit public comments.

## **RESPONSIBLE OFFICIAL AND DECISION TO BE MADE**

This EIS is not a decision document. Its primary purpose is to disclose the environmental consequences that are anticipated to occur through implementation of the alternatives under consideration.

The final decision will be documented in a ROD issued by Becki Heath, Forest Supervisor for the Gallatin National Forest. The ROD will be issued together with the FEIS and will identify the Forest Supervisor's Selected Alternative as well as the environmentally preferable alternative. The decision contained in the ROD will be subject to appeal by the Regional Forester under the appeal regulations described in 36 CFR 215 (June 4, 2003). Decisions made in the ROD for this NEPA document will be valid for the next five to ten years; however, the

Selected Alternative, as identified in the ROD, will provide the framework that will guide development of Bridger Bowl for the life of the SUP.

In addition to determining which alternative to select, the Forest Supervisor will also determine which mitigation measures to require. The Forest Supervisor may also require additional mitigation measures beyond those specific in Table 3.

In compliance with Forest Service Handbook 1909.15 chapter 18, the Forest Service will continually review the relevancy of the analysis and subsequent decision for new and changed conditions as any approved projects are advanced for implementation.





# BRIDGER BOWL SUPPLEMENTAL DEIS

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Gallatin National Forest  
Bozeman Ranger District

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## LIST OF ACRONYMS

AADT	Average Annual Daily Traffic	MDEQ	Montana Department of Environmental Quality
AQB	Air Quality Board	MDFWP	Montana Department of Fish Wildlife and Parks
BA	Biological Assessment	MDP	Master Development Plan
BBSA	Bridger Bowl Ski Area	MDSL	Montana Department of State Lands
BE	Biological Evaluation	MG	million gallons
BSL	Big Sky Lumber	MIS	Management Indicator Species
BMPs	Best Management Practices	MNHP	Montana Natural Heritage Program
BRD	Bozeman Ranger District	NAAQS	National Ambient Air Quality Standards
CCC	Comfortable Carrying Capacity	NEPA	National Environmental Policy Act
CEQ	President's Council on Environmental Quality	NF	National Forest
cfm	cubic feet per minute	NOI	Notice of Intent
CFR	Code of Federal Regulations	NO <sub>x</sub>	Oxides of Nitrogen
cfs	cubic feet per second	NSAA	National Ski Areas Association
CO	Carbon Monoxide	PAOT	Person-at-one-time
csm	cubic feet per second per square mile of watershed area	PM <sub>10</sub>	Particulate matter a diameter of less than 10 microns
dba	decibel, measurement of weighted sound pressure level	PM <sub>2.5</sub>	Particulate matter a diameter of less than 2.5 microns
dbh	diameter breast height	REC	Recreation
DEIS	Draft Environmental Impact Statement	ROW	Right-of-Way
ECRP	Erosion Control and Revegetation Plan	RVD	Recreational Visitor Days
EIS	Environmental Impact Statement	SAOT	Skiers-at-one-time
ELT	Ecological Land Types	SIP	State Implementation Plan
EPA	US Environmental Protection Agency	SMZ	Stream Management Zone
ESA	Endangered Species Act	SUP	Special Use Permit
EVC	Existing Visual Condition	TMDL	Total Maximum Daily Load
FEIS	Final Environmental Impact Statement	USACE	United States Army Corps of Engineers
FTE	Full-time equivalent	USDA	United States Department of Agriculture
GNF	Gallatin National Forest	USFS	United States Forest Service
GFA	Gross Fixed Assets	USFWS	United States Fish and Wildlife Service
gpm/GPM	gallons per minute	USGS	U.S. Department of Interior Geological Survey
GYE	Greater Yellowstone Ecosystem	µg/m <sup>3</sup>	Micrograms per Cubic Meter
HDR	Higher Density Residential	VMT	Vehicle Miles Traveled
HMU	Habitat Management Unit	VOC	Volatile Organic Compounds
HWI	Hawk Watch International	VQO	Visual Quality Objective
ID Team	Interdisciplinary Team	VRMS	Visual Resources Management System
IRA	Inventoried Roadless Area	WQLS	Water Quality Limited Segments
KVA	kilovolt amperes		
LOS	Level of Service		
MA	Management Area		
MCAA	Montana Clean Air Act		





# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 1

### Purpose and Need



Gallatin National Forest  
Bozeman Ranger District

## **1.0 PURPOSE AND NEED**

### **1.1 SKI AREA BACKGROUND**

The Bridger Bowl ski area (Bridger Bowl) is located in Bridger Canyon, approximately 15 miles northeast of Bozeman, Montana (see Figure 1-1). Bridger Bowl, Inc., a non-profit Montana enterprise operates the ski area. Bridger Bowl, Inc. currently owns approximately 480 acres on the lower mountain and has a Special Use Permit (SUP) from the Gallatin National Forest (GNF) for use of approximately 1,042 acres of National Forest System (NFS) lands. The Study Area for this analysis includes the current SUP area, those NFS lands proposed for SUP area expansion, and the private lands within and adjacent to the Bridger Bowl; it totals approximately 2,574 acres.

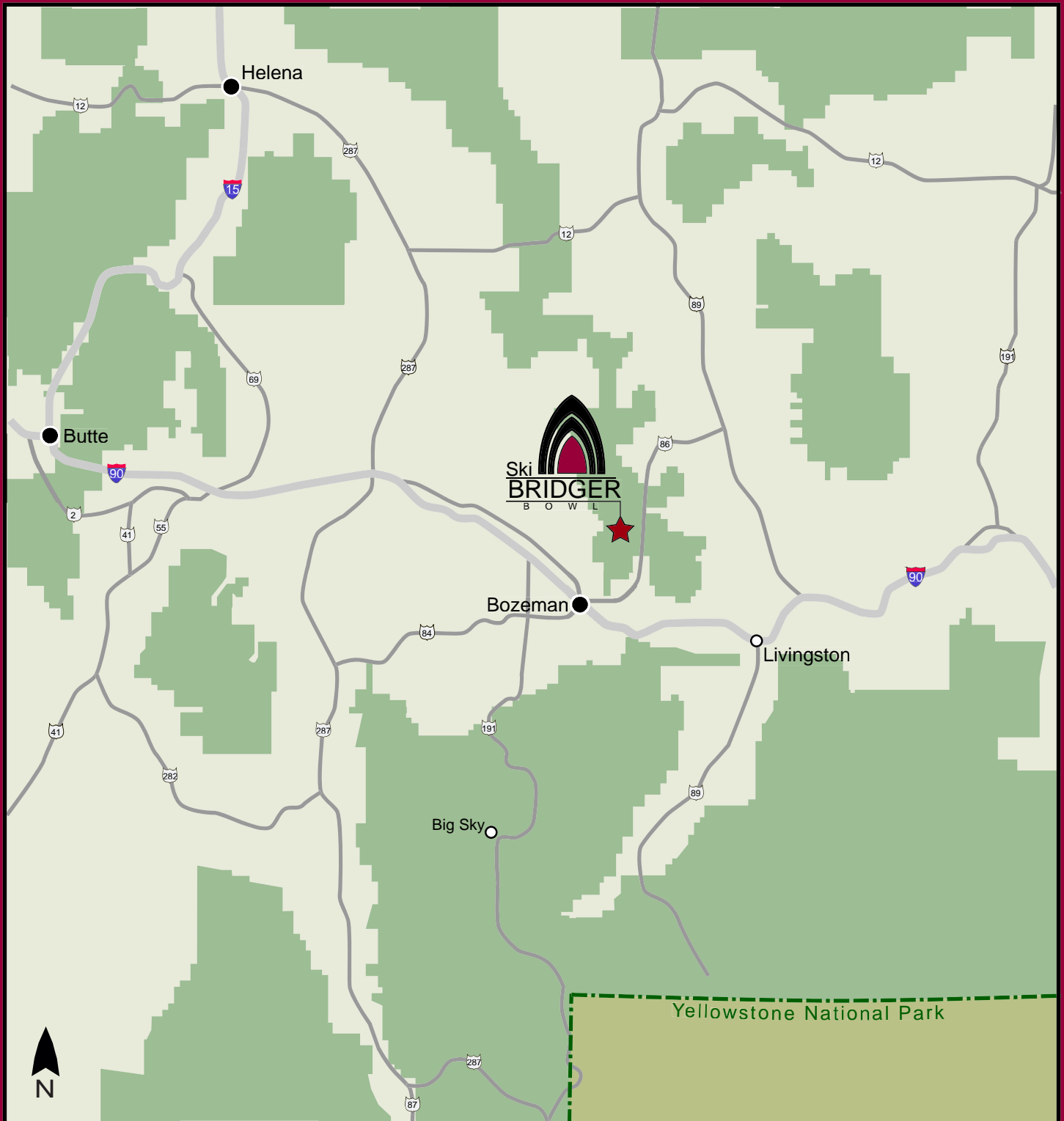
Local Bozeman skiing enthusiasts began using the area in the mid-1940s. The State of Montana negotiated with the local landowner and purchased 120 acres near the base of the Bridger Mountains for access to the national forest and for the proposed State Park and ski area in 1949. Although the plans for a State Park fell through, the local ski enthusiasts organized themselves as the Bozeman State Park Recreational Association (BSPRA) and continued with plans to develop a winter sports area beyond the State land. In 1954, the Forest Service issued the BSPRA a SUP to operate a rope tow and construct a parking area on NFS lands. For the past 50 years, Bridger Bowl, Inc. has pursued acquiring lands in the base area and has used this property to construct parking lots, base lodges, a ski patrol building, and ski terrain for beginners and novice skiers. The area has grown from one rope tow to eight lifts (including one surface lift reserved for ski patrol access to the ridge), 69 developed skiing trails, and two day lodges, with another lodge under construction in 2003 that is scheduled to open in 2004.

### **1.2 PROJECT BACKGROUND**

A draft Environmental Impact Statement (DEIS) for the Bridger Bowl Special Use Permit Renewal and Master Development Plan Update was prepared by the Forest Service in 1998 to and distributed for public comment in April 1999. It provided analysis of the effects of expanding the SUP boundary to the north and south, amending relevant Forest Plan Management Area prescriptions to conform to the proposed SUP expansion, and approving the revised Bridger Bowl Master Development Plan (MDP). Based upon review of the numerous comments received by the public and the need for new or revised analyses of resources (e.g., Threatened, Endangered, or Sensitive species; old growth forest; and additional analysis of cumulative effects), the Forest Service determined that the preparation of a Supplemental DEIS (SDEIS) would be the most effective way to present new information and respond to public comments on the DEIS. This SDEIS supercedes and replaces the 1999 DEIS, and includes changes to the proposed project elements that have taken place since the 1999 DEIS (Table 1.2-1). Many of the issues raised during the comment period for the 1999 DEIS have been incorporated into this SDEIS. In addition, new topography information and new, more accurate GIS methods have been used for the analysis in this SDEIS. A summary of public comments received on the DEIS is included in this document as Appendix B.



**Figure 1 - 1**  
***Location Map***



**Table 1.2-1**  
**Summary Comparison of Proposed Action Elements**

<b>1999 DEIS Project Proposal</b>	<b>2003 SDEIS Project Proposal</b>
Renew SUP	Not required, SUP renewed in 2002 with existing boundary with a reduction of the west boundary
Expand SUP boundary on north and south, reduce boundary on the west to the ridge	Expand SUP boundary on north and south
Change designation of lands to MA 2 on north side of existing SUP (Bradley Meadows) and establish MA 2 on currently undesignated areas	Same
Construct seven new lifts, remove one lift and replace one lift	Construct six new lifts, remove one lift, replace one lift, and modify two lifts
Develop 22 new ski runs; plus N-8 access trail	Develop 16 ski trails; including N-8 access trail
Construct 4 new roads and relocate Bohart Ranch Trail, "Good Clean Fun"	Construct 1.8 miles of new roads (eight segments to proposed lifts and one to Limestone Chalet). No need to relocate Bohart Ranch Trail, "Good Clean Fun"
Expand Snowmaking from 10 to 27 acres	Snowmaking expansion completed, currently 27 acres of snowmaking coverage

Since the 1999 DEIS was issued, some construction activities have taken place at Bridger Bowl, both on private Bridger Bowl property and NFS lands. The Forest Service issued a new SUP to Bridger Bowl for operations within the existing SUP boundary in November 2002 under the authority of National Forest Ski Area Permit Act of 1986 (16 U.S.C 497b). This permit issuance did not constitute a major federal action under the terms of the National Omnibus Parks and Public Lands Management Act of 1996 (16 U.S.C 497c); however, one of the requirements of the new SUP is to have an accepted MDP on file. Bridger Bowl submitted a revised MDP to the Forest Service to fulfill this requirement; the accepted MDP is dated February 2002. The new SUP includes an adjustment to the western boundary of the Bridger Bowl SUP 50 feet west of the ridge line to accommodate Inventoried Roadless Areas. The 136-acre parcel that is now excluded from the SUP area was designated MA12 and has been appended to the GNF Forest Plan. The area of the Bridger Bowl SUP area has been issued for 1,042 acres as a result of this SUP area adjustment.<sup>1</sup> This SUP boundary adjustment of approximately 100 acres was discussed in the 1999 DEIS.

Since 1995, Bridger Bowl has completed several projects on both private and public lands to improve the existing conditions and meet the demands of today's skiers. On private lands, Bridger Bowl had parking lots designed and constructed to meet the Bridger Canyon Zoning Ordinance requirements. They have also completed the installation of a new wastewater treatment system, under the jurisdiction of Montana Department of Environmental Quality. A new Ski Patrol building has been constructed on private lands adjacent to the Jim Bridger Lodge

<sup>1</sup> The current SUP indicates that the permit area is 1,042 acres; however, GIS analysis more accurately indicates the actual area of the SUP is 1,122 acres. The permitted SUP area (1,042 acres) is used throughout the text portions of this SDEIS, while the GIS-derived SUP area (1,122 acres) is used for all GIS analysis and data tables within this SDEIS.

in November 2002. Construction of a new 35,629 square foot new Day Lodge began in the summer of 2003 and is scheduled for completion in 2004. Also, a beginner lift (Snowflake) was constructed on private lands adjacent to the lower portion of the Virginia City lift in the summer of 1999.

Over consecutive summers from 1998 to 2003, additional snowmaking lines were installed near the Virginia City Lift expanding the snowmaking coverage from 10 acres to 27 acres to allow for more reliable early season openings and to improve the quality of the skiing experience for beginners. The volume and timing of water withdrawals were not changed from conditions before the snowmaking expansion, and as such, water rights and instream flows were not affected (Bridger Bowl Management, 2003). All of these activities have occurred on private lands; however, the cumulative effects of these projects are included in this SDEIS.

The Powder Park Lift provides an access route for skiers accessing the Alpine and Bridger lifts and was designed to compensate for the shortening of the Alpine lift in 1995. The patrol surface lift (P-1) was replaced with a new platter lift, with no change to the ski patrol only access policy. This project was approved by the USFS as part of the 2000 summer construction plan. In 2001, the Pierre's Knob lift was replaced with a fixed grip triple chair to reduce lift lines and the unloading area was graded to allow for easier access for lower ability skiers.

In addition to projects and activities that have occurred at Bridger Bowl since the release of the 1999 DEIS, changes to the proposal have occurred as a result of new information and in response to public comments received on the 1999 DEIS; this is pertinent primarily to the Bradley Meadows portion of the analysis area. The options described in the 1999 DEIS for the N-1 and N-2 lifts have been reviewed and consolidated into a single lift line (identified as N-1 in this SDEIS). One ski run has been eliminated from the Proposed Action and three others have been removed from connected or reasonably foreseeable actions. Furthermore, the N-3 lift, described in the 1999 DEIS, has been eliminated. These project elements have been eliminated from the original proposal due to changes in other projects beyond the scope of this proposal (i.e., 360 Ranch). As a result, these projects are not included in this SDEIS; they are not proposed or under consideration by any known agencies at this time.

### **1.3 PURPOSE AND NEED**

The Forest Service and Bridger Bowl management worked cooperatively to develop the purpose and need for this proposal. The overall purpose of the projects within the Bridger Bowl Master Development Plan Update 2002 is to improve the current recreation experience at Bridger Bowl, and address the expected growth in skier visits over the 40-year duration of the SUP in a financially sound manner.

Over the past 50 year operational period of Bridger Bowl, the ski area has seen increases in annual skier visits, with annual skier visits growth reflecting the growth in population in the region. This growth in annual skier visits is affected by the amount and timing of snowfall among other factors.

While the regional population has increased, other regional ski areas that compete with Bridger Bowl have expanded. Despite the increased number and size of the competition, Bridger Bowl continues to attract a high percentage of local skiers, and guests often experience crowded conditions in lift lines and on popular ski trails during busy periods.

Prior to the expansion of the parking and current expansion of the base area facilities, Bridger Bowl visitors regularly found crowded conditions in the parking and lodge facilities. These crowding conditions resulted in decreases in the largest single day (peak day) skier visits. Previous Bridger Bowl MDPs indicated the need for expanded base facilities; focus group studies conducted by Bridger Bowl in 1999 reconfirmed the need for improved facilities and “uncrowded” skiing.

Three needs must be met to achieve this overall purpose: 1) continue to provide uncrowded skiing by better accommodating high demand periods, 2) provide for new trails and lifts to retain existing skiers and attract new skiers by providing terrain variety and a range of trails for all ability levels, and 3) accommodate anticipated growth while maintaining the desired uncrowded slope conditions.

**Need 1: To continue to provide uncrowded skiing by better accommodating high use periods.**

*Background*

The current Comfortable Carrying Capacity (CCC) for lifts and terrain at Bridger Bowl is 3,200 skiers. On peak days, which are typically comprised of weekends, holidays, and big snow days, Bridger Bowl has observed up to 4,525 skiers. More routinely, the resort sees high use days of 3,500 skiers. On these days, guests often experience full parking lots, long lift lines, crowded slopes, and congested skier service facilities.

Skier focus group surveys, conducted by Bridger Bowl, indicated that a high quality recreation experience includes uncrowded slopes, a variety of slopes and terrain, low prices, and access to ridge skiing (Bridger Bowl Focus Group Study, 1999). Due to the close proximity of the ski area to Bozeman and the high number of local skiers, Bridger Bowl experiences high weekend and low midweek skier utilization levels. This utilization pattern tends to create a more expensive and inefficient resort operation, in that the ski area infrastructure realizes low utilization midweek. The current use pattern also results in the perception of crowded weekends at the resort. Although skier visitation continues to increase annually, peak day visitation has decreased since 1995. The reduction in the quality of the recreation experience has had a direct effect on visitation patterns and an indirect effect on the economic viability of the resort.

On-slope congestion is partially controlled by lift capacity; the lift only delivers a certain number of persons per hour despite high demand. Under peak conditions, the length of time and number of people in the lift line expands to unacceptable levels. Increasing lift capacity, without terrain expansion, would increase skier density above current levels and not address issues of amount and variety of terrain.

A second crowding condition occurs during periods of high snowfall or adverse wind conditions. During this condition, lifts and trails that are below avalanche terrain cannot be opened or have delayed openings until avalanche hazard reduction is accomplished. This means that in a highly desirable skiing condition (i.e., good new snow conditions), skiers who wish to utilize the Bridger Lift and Deer Park lifts are diverted to the Pierre's Knob and to a lesser degree, the Alpine lift. The diversions create long lift lines, sometimes in excess of three times the lift ride time (Bridger Bowl Management, 2003). This condition also causes more advanced, faster skiers to utilize terrain more used by lower ability level skiers, creating the potential for skier conflicts on limited terrain.

### *Focus*

Reducing skier congestion at the base of lifts and on existing trails could be accomplished via the expansion of skiable terrain at Bridger Bowl, installation of new lifts, and modification of existing lifts. Expansion of skiable terrain would create more areas in which people could ski and help better distribute skiers across the mountain. Installation of new lifts would serve the new terrain in the expansion areas and increase access to existing ski terrain along the ridge, which is currently accessible only by foot. New lifts, located in areas of reduced avalanche potential, could distribute skiers better and reduce the mixing of different ability level skiers during times of snow safety concerns. Modification of some of the existing lifts within the SUP would improve skier circulation among lifts near the Deer Park Chalet.

**Need 2: To provide new trails and lifts to help retain existing skiers and attract new skiers by providing a range of trails for all ability levels and terrain variety.**

### *Background*

Bridger Bowl has seen modest development over the past eight to ten years, with projects on both private and NFS lands designed to improve the recreation experience and better meet skier demands. In contrast to Bridger Bowl's modest development over the past eight years, Big Sky (45 miles from Bozeman) has developed 13 new lifts in the past 10 years (Big Sky Resort; website; November, 2003). Moonlight Basin, adjacent to Big Sky (47 miles from Bozeman) opened with four lifts as an independent ski area (Moonlight Basin website, December 2003). The Discovery Ski Area (134 miles from Bozeman) has added three new lifts since 2002 with three new trails in 2003 (Discovery Ski Area website, November 2003). Expansion of lifts, trails and facilities has also take place at Red Lodge Mountain Resort in Red Lodge, Montana and Big Mountain Ski and Summer Resort in Whitefish, Montana. A new ski area named Blacktail Mountain near Kalispell, Montana also opened recently.



### *Focus*

Bridger Bowl could expand the amount and variety of skiable terrain available by incorporating the Slushman Drainage and Bradley Meadows areas into its SUP. The Slushman Drainage has already been allocated for winter sports (ski area) by the Forest Plan. Bridger Bowl could also provide increased access to existing ski terrain within the SUP area. Opportunities for expansion would create additional ski terrain for intermediate, advanced, and expert skiers as well as provide a diversity of terrain at the resort. Additional lift service to the ridge would also enhance access to unique ski terrain within the existing SUP area.

### **Need 3: To accommodate anticipated growth in visitation at Bridger Bowl.**

#### *Background*

Skier visits have increased by approximately 1.5 percent per year over the past 15 seasons (Bridger Bowl Management, 2003). Similarly, average annual growth in Gallatin County/Bozeman has been approximately 1.6 percent (Greater Bozeman Area Transportation Plan; Bozeman Transportation Coordinating Committee, 2001). Due to the strong connection between the community and the ski area, increases in skier visitation are directly tied to population growth.

As stated previously, the lift and terrain CCC for Bridger Bowl is 3,200 skiers. Using the population growth rates identified above, and a similar relationship between annual skier visit growth and population growth, Bridger Bowl will need to accommodate to 4,500 skiers, with an ability to handle peak days of up to 6,000 within the next 10 years.

Some of this expansion has taken place in the parking and skier services areas after 1999, so that the capacity of the guest services is 5,400 skiers. With completion of the base area improvements, parking congestion has been reduced, and facility congestion will be reduced upon completion of the new day lodge.

### *Focus*

Accommodations for anticipated growth in the market could be accomplished via the expansion of skiable terrain and by providing increased access to existing ski terrain within the SUP area. Opportunities for expansion would create additional ski terrain for intermediate, advanced, and expert skiers as well as providing a diversity of terrain at the resort. Upgrading some of the existing lifts, as well as installing new lifts, would increase uphill capacity to service new and existing terrain. Providing lift service to the public to the ridge would enhance access to unique ski terrain within the existing SUP area.

## **1.4 SCOPE OF THE PROPOSED ACTION AND FORMAT OF THE SDEIS**

The scope of this SDEIS includes the range of actions, alternatives, and impacts associated with the proposal. It also includes the geographical, spatial, and temporal boundaries involved. Chapter 2 describes the individual project elements in detail. Chapter 3 defines the scope of analysis, or study area, included in each resource section and provides an analysis of existing conditions. Chapter 4 then analyzes the environmental and social impacts associated with each alternative within the study area.

The SDEIS is presented in four major chapters, each of which provides an essential element of the environmental impact analysis as required by Council of Environmental Quality (CEQ) and NEPA guidelines. This analysis includes direct and indirect effects to resources as well as the connected, cumulative, and similar actions identified in the scoping process. A summary as required by CEQ/NEPA guidelines is included at the beginning of this document as the Executive Summary.

Information collected and analyzed as part of the SDEIS preparation is available for review at the Bozeman Ranger District of the GNF. This information is referenced as the project file in the document.

**CHAPTER 1** - Purpose and Need - describes project background, the Proposed Action, the purpose of and need for the Proposed Action, management direction, the public involvement process and resulting issues, the decision to be made, and additional permits required.

**CHAPTER 2** - Description of Alternatives - describes the alternatives considered but eliminated from detailed study in the EIS as well as the four alternatives considered in the DEIS, including the No Action alternative. It also describes the methodology of the evaluation and selection of alternatives. All proposed mitigation measures are listed in this chapter.

**CHAPTER 3** - The Affected Environment - describes the existing physical, biological, economic, and social environment that may be affected by the alternatives. These existing conditions are described in terms of resource areas such as water resources, wildlife, fisheries, recreation, and socio-economics. The detail presented in this chapter provides the basis for, and supports the analysis of, the impacts defined in Chapter IV.

**CHAPTER 4** - Environmental Consequences - describes in detail the potential physical, biological, economic and social consequences of the alternatives by resource area. Direct, indirect, and cumulative effects of implementing the alternatives are described. This chapter also identifies impacts that cannot be avoided, the relationship between short-term uses of the environment and long-term productivity, and any irreversible and irretrievable commitments of resources.

**CHAPTER 5** - List of Preparers - provides a list of the preparers of the SDEIS.

**CHAPTER 6** – Agencies and Other Governments Consulted - lists the agencies, other governments, and organizations that were consulted to assist in the preparation of the SDEIS.

**CHAPTER 7** - References - provides a list of documents referenced in the SDEIS.

**CHAPTER 8** - Glossary – provides a list of terms used in the SDEIS and their definitions.

**CHAPTER 9** - Index – provides a list of key terms used in the SDEIS and where to locate them within the document.

Additional elements of this SDEIS include a table of contents, a list of acronyms, and four appendices.

## **1.5 SCOPING AND PUBLIC INVOLVEMENT**

A notice of intent (NOI) to prepare an EIS was published in the Federal Register on June 13, 1997. Sixty-six letters were sent, using the GNF mailing list, to federal, state and local government agencies, Native American tribes and groups, and individuals interested in Forest activities. The GNF created an interdisciplinary team (IDT) to coordinate the scoping process within the Forest Service and assist in the development of issues and alternatives in response to the issues raised during the scoping process. Internal scoping involved meetings with IDT members on the Bozeman Ranger District and the GNF. Written correspondence with the USDI-Fish and Wildlife Service (USFWS) identified wildlife species of concern.

This project has been under discussion since 1986. Numerous newspaper articles (Bozeman Chronicle 6-23-91, 10-23-96, 10-24-96, 6-20-97, 6-24-97, Lone Peak Lookout 9-19-97) and local radio interviews have been prepared and conducted for the project at various times over the past 17 years. Several public meetings have also been held to discuss the various past proposals and consultant studies (June 23, 1997 - 3 PM and 7 PM Open House at Bozeman Ranger District offices, Bozeman, MT). A total of 87 letters and telephone calls were received and recorded in response to the initial scoping process. Additional comments were received during the two open houses. A synthesis of comments received during the initial scoping process is included in this document as Appendix A.

## **1.6 ISSUES RAISED DURING SCOPING**

The comments received during the scoping process raised issues, concerns, or questions regarding the environmental effects of the project or alternatives. Some issues were identified by the public during the scoping process; other issues relate to resources that are protected by federal and/or state laws or management practices, and as such, they require analysis in the EIS.

From comments received during scoping and the comment period for the 1999 DEIS, issue statements were developed and refined to provide a measurable estimate of the environmental consequences that could result from each of the action alternatives. The intent of the following

issue statements is to clearly identify environmental resources that may be affected by specific activities associated with the implementation of each alternative.

### **Visual Resources**

Existing ski trails at Bridger Bowl are visible from many locations adjacent to the project. Implementation of the Proposed Action would result in the location and construction of additional ski trails. This has the potential to change the existing visual condition as observed from various points, of which Bridger Canyon Road (BCR) was identified as the critical viewing point. Effects to this resource are estimated through comparison of existing visual conditions in the Bridger Bowl study area against impacts of alternative implementation.

### **Roadless**

About 101 acres of the proposed expansion into the Slushman drainage basin to the south would be within the Bridger Bowl Roadless Area #1534. Effects to this resource are estimated through comparison of existing roadless characteristics (i.e., Natural Integrity, Natural Appearance, Remoteness, Solitude, and Special Features and Boundary Management) against expected impacts of alternative implementation.

### **Watershed**

The Proposed Action has the potential to affect water quality and quantity. Existing water quality may be affected by surface and subsurface ground disturbance. These disturbances may include construction of parking areas, ski trails, access roads, and area operations such as increased demands on water and the sewer/septic system. Flow regime and channel morphology may be affected by these disturbances, which could alter the hydrologic response of the watershed. Water quality effects have been estimated by comparing existing sedimentation and water quality in surface and subsurface water resources to the condition under the developed condition. Water quantity effects have been estimated through the use of computer models and professional interpretation of the modeled effects under the developed condition in the SDEIS.

### **Wildlife**

The Proposed Action has the potential to affect Threatened, Endangered, Proposed, Sensitive, and/or Management Indicator species. Habitat removal from the installation of chairlifts and the construction of ski trails may negatively affect the viability of species within Bridger Bowl study area. Effects on wildlife habitat are estimated through analysis of survey information and comparison of the existing wildlife habitat to wildlife habitat under the developed condition. Effects on wildlife disturbance are estimated by comparing existing use of Bridger Bowl and the disturbance regime to the anticipated condition after development.

### **Fisheries**

The Proposed Action has the potential to affect habitat for aquatic species in the South Fork of Brackett Creek, which is inhabited by Yellowstone cutthroat trout and other species. Effects have been estimated through comparison of the existing aquatic habitat conditions to the anticipated conditions after development and how habitat changes would affect these species.

### **Wetlands**

Several small wetlands occur in or near the project area. The Proposed Action has the potential to affect the wetlands by construction or operation activities. Effects to wetlands are estimated

through comparison of the existing area and function of wetlands against the effects of development on the area and function of wetlands.

### **Recreation/User Conflicts**

The proposed expansion of the SUP boundary may block access to or result in a loss of backcountry skiing and snowboarding terrain. Effects will be estimated through comparison of the existing capacity and economics of the ski area to the developed condition. Effects to backcountry and Nordic skiing have been estimated in the SDEIS by comparing the existing opportunities for these activities to the opportunities available under the developed condition.

## **1.7 ADDITIONAL ISSUES RAISED DURING THE DEIS PROCESS**

Additional input on the document was received during the comment period for the 1999 DEIS; these comments raised issues, concerns, or questions regarding the environmental effects of the project or alternatives that were not clearly addressed or were not included in the 1999 DEIS. Additional issue statements were developed and refined to provide a measurable estimate of the environmental consequences that could result from each of the action alternatives and to include this information in the SDEIS. A more complete summary of the comments received during scoping is included as Appendix B in this document.

### **Purpose and Need**

The document needs to better support the purpose and need to expand the ski area beyond its existing boundaries.

### **Recreation**

Dispersed recreation and access to public lands needs to be described in more detail in the document. Additionally, ski area capacity across the alternatives should be described more clearly. Lastly, snowmobile use within the area needs to be addressed.

### **Socio-Economic Resources**

The issue of Environmental Justice was not outlined in the document; there are potential effects to minority and low-income populations as a result of this proposal.

### **Noise**

The document should describe current noise levels and anticipated effects as a result of the proposal.

### **Safety**

The document should describe more clearly about issues of safety including skier safety, transportation and road safety, and emergency services.

### **Watershed Resources**

The document should describe the anticipated road density at Bridger Bowl. It should also include a map of affected watersheds as well as disclose impacts to wetlands.

## **Vegetation**

The document needs to describe the potential for noxious weeds to invade the project area as a result of construction. It should also describe effects to white bark pine.

## **Wildlife and Fisheries**

There is no documentation of correspondence with the US Fish and Wildlife Service in the document. Additional surveys are requested for the boreal owl, wolverine, flammulated owl, and goshawk. Impacts to the Yellowstone cutthroat trout need as a result of increased snowmaking need to be more clearly defined.

## **Cumulative Effects**

The document inadequately describes cumulative effects, particularly any reasonable foreseeable actions.

## **1.8 FOREST PLAN MANAGEMENT DIRECTION**

The 1987 Forest Plan is the comprehensive, long-term planning document for the GNF. Consisting of inventory and analysis, the Forest Plan is the primary planning tool used by the Forest Service to balance competing resource uses on the GNF. The Proposed Action and alternatives considered in this analysis were formulated within the framework of the management direction contained in the Forest Plan, which is a guide for the management and use of the GNF. There are a variety of laws and regulations that require the Forest Service to work with private industry to provide needed recreation facilities on NFS lands, including downhill ski areas. The Forest Service is to provide recreational opportunities on NFS lands funded through private enterprise (16 U.S.C. 497). As such, the Forest Plan identifies a desired mix of resource uses and specific permits under which these uses may be authorized. Special Use Permits (SUPs) are to be administered for recreation uses that serve the public, promote public health and safety, and protect the environment.

### **Forest-wide Goals and Objectives**

Provide for a broad spectrum of recreation opportunities in a variety of Forest settings (p II-1).

Designated ski and snowmobile trails will provide winter recreation opportunities in areas with low avalanche hazard (p II-2).

### **Forest-wide Standards**

Forest-wide standards for recreation are to: 1) expand existing ski areas (on NFS lands, i.e., Bridger Bowl) prior to considering any new proposals, and 2) meet ADA requirements with new construction and upgrades (p. II-15). The Forest Plan also states that expansion of Bridger Bowl, Big Sky,<sup>2</sup> and the potential development of Ski Yellowstone<sup>3</sup> ski areas will be given priority before any new proposals for ski areas are approved (p. II-15).

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<sup>2</sup> Big Sky Resort is located on private lands and not under the authority of the GNF.

<sup>3</sup> Ski Yellowstone is not the same area as the existing Yellowstone Club, which is located on private lands.

## **Management Area 2 – Winter Sports (Ski) Areas**

Ski areas on the GNF are allocated to Management Area (MA) 2. MA 2 encompasses the Bridger Bowl SUP area, including ski trails, lift facilities, and buildings, as well areas that exhibit potential for development or expansion of facilities to meet increasing demand for downhill skiing on NFS lands (p. III-4).

Specific goals for MA 2 include:

- Manage these winter sports areas in accord with approved master plans.
- Ensure that permit holders providing service to the public have inspection, maintenance, and documentation processes that provide for applicable public health and safety standards.

## **Forest Plan Consistency**

In addition to meeting the specific goals and standards for MA 2, the proposed MDP would be consistent with forest-wide standards. Proposed lift, ski terrain, day lodge, parking, and other base area improvements on private land were determined by the Forest Service to be consistent with the Forest Plan, which states that “the private sector will be encouraged to provide facilities and services on private land where needed to serve the public” (p. II-3).

Proposed expansion of the SUP area into the Slushman Drainage would be consistent with the Forest Plan. This area is currently allocated to MA 2, identified for future ski area expansion. To the north (Bradley Meadows), approximately 104 acres located south of the existing MA 12 and directly north of the existing MA 8, in Section 13, was acquired by the Forest Service via a land exchange in 1993 with no current management area designation. The purpose of the acquisition of these lands was to provide for additional developed winter recreation and the eventual expansion of Bridger Bowl. (Marlenee, 1999) The Forest Service has identified the 104 acres as appropriate for the land allocation of MA 2 (see figures 2-2 and 2-4) for existing and proposed land allocations and MAs).

## **1.9 DECISION TO BE MADE**

This SDEIS documents site-specific environmental analysis for each of the alternatives. Based on this analysis, the Forest Supervisor is the responsible official who will decide which alternative to select and allow to be implemented. The Forest Supervisor may select any one of the alternatives or components from among the alternatives. As required by NEPA [40CFR 1502.14(d)], a no action alternative has been included as a baseline by which to compare the effects of each action alternative. Decisions made in the ROD for this NEPA document will be valid for the next five to ten years; however, the Selected Alternative, as identified in the ROD, will provide the framework that will guide development of Bridger Bowl for the life of the SUP.

## **1.10 PERMITS REQUIRED**

This SDEIS is designed to serve as an analysis document for parallel processes at several levels of government. The Forest Service decision would apply only to NFS lands analyzed within this SDEIS. However, potential effects resulting from implementation of any of the action

alternatives on lands and activities administered by other federal, state, and local jurisdictions are also disclosed within this SDEIS.

Decisions by other jurisdictions to issue or not issue approvals related to this proposal may be aided by the analyses presented in this SDEIS. While the Forest Service assumes no responsibility for enforcing laws, regulations, or ordinances under the jurisdiction of other governmental agencies, Forest Service regulations require permit holders to abide by applicable laws and conditions imposed by other jurisdictions. In addition to requisite Forest Service approvals, the following permits or approvals may be required to implement the Proposed Action:

- State of Montana Permit to construct in stream corridors.
- Army Corps of Engineers 404 Permit for impacts to streams.
- 310 Permit from the Gallatin Soil Conservation District for disturbance of perennial streams.
- Water rights and/or permits necessary to meet expanded domestic water demand requirements.
- National Historic Preservation Act, Section 106 consultation with the State Historic Preservation Office for impacts to heritage resources.
- NPDES stormwater permit from the EPA or appropriate state agency and a Stormwater Pollution Prevention Plan for land disturbing activities greater than one acre.
- Endangered Species Act, Section 7 consultation with the USFWS for impacts to wildlife has already been completed for this proposal. A Biological Assessment (BA) was prepared by the Forest Service and submitted to USFWS to initiate the Section 7 consultation process in February 2003. The USFWS returned a Biological Opinion (BO) on the project that included a determination of “not likely to jeopardize the continued existence of Canada lynx.”





# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 2

### Description of Alternatives



Gallatin National Forest  
Bozeman Ranger District

## **2.0 DESCRIPTION OF ALTERNATIVES**

NEPA regulations require that all reasonable alternatives be considered to ensure that proposed actions are well conceived and thoroughly evaluated (40 CFR 1502.14a). Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint, using common sense, rather than those that are simply desirable (46 CFR 18027).

This chapter identifies and compares a reasonable range of alternatives for the Bridger Bowl MDP Proposal. A No Action alternative and three action alternatives, including the Proposed Action, are included within this range of alternatives. These alternatives have been developed in accordance with CEQ regulations to provide the decision-maker with a clear basis for choice (40 CFR 1502.14).

Chapter 2 also identifies and discloses the process used to develop alternatives, alternatives considered but eliminated, modifications to the Proposed Action, and all alternatives considered in detail. Chapter 2 includes a summary table comparing potential environmental consequences as a result of implementation of each alternative and measures proposed to mitigate these potential environmental effects. The Study Area for this analysis includes the current SUP area, those NFS lands proposed for SUP area expansion, and the private lands within and adjacent to the Bridger Bowl; it totals approximately 2,574 acres.

### **2.1 DEVELOPMENT OF ALTERNATIVES**

In the development of alternatives for this proposal, the Forest Service has utilized direction provided in the CEQ regulations, the Forest Service Manual, and the Forest Service Handbook (FSH 1909.15), as well as results from the public scoping process. According to NEPA regulations, an Environmental Impact Statement (EIS) must “explore and objectively evaluate all reasonable alternatives” related to the purpose and need of the project (40 CFR 1502.14). The range of alternatives presented in this Supplemental Draft EIS (SDEIS) is intended to:

- Provide clear choices for the decision-maker;
- Fulfill the purpose and need for the Proposed Action;
- Address significant issues; and
- Remain consistent with the goals, objectives, standards, and guidelines in the 1987 Forest Plan and other applicable laws, regulations, policies, and plans.

Alternatives to the Proposed Action were developed by the Forest Service Interdisciplinary Team (ID Team) in order to reduce or eliminate possible effects of the action as identified by significant issues raised during the scoping process. Where feasible, potential effects of the construction of specific elements or groups of elements within the Proposed Action were reduced or eliminated by making revisions to the Bridger Bowl MDP proposal. Including the Proposed Action, ten different alternatives were considered.

The ID Team then considered the feasibility of implementing the Bridger Bowl MDP under each of the ten alternatives by determining whether the alternatives could be feasibly implemented, if they would actually reduce impacts to the targeted resource areas, and if they would meet the Purpose and Need for the proposal. The Forest Supervisor of the GNF approved a range of four alternatives, including the No Action Alternative, for detailed analysis in the SDEIS. This range of alternatives is intended to respond to the significant issues raised during scoping.

## **2.2 ALTERNATIVES CONSIDERED BUT ELIMINATED**

### **2.2.1 REMOVAL OF P-2 LIFT AND CONSTRUCTION OF A SHORTENED SLUSHMAN LIFT TO AVOID IMPACTS TO INVENTORIED ROADLESS AREAS (IRAs)**

This alternative was identified to consider the effects of the reducing the lift system in the Slushman area, avoiding potential impacts to IRAs. The description of the current Proposed Action already indicates that no roads would be constructed to the proposed P-2 lift in the IRAs, and other impacts of the skiing and lifts are illustrated in the action alternatives. This alternative would not meet the project Purpose and Need for a lift system in the Slushman area for access to the ridge for avalanche control.

### **2.2.2 INCREASED SKI AREA CAPACITY THROUGH FACILITY UPGRADES WITHIN THE EXISTING SKI AREA, NO SUP EXPANSION**

This alternative was identified to assess the possibilities of expansion of facilities within the current ski area boundary. At the time of the 1999 DEIS, facilities were limited in the base area and in the ski terrain in general. Base area capacities have been increased on private lands to meet growing demand. To increase capacity for future demand and reduce existing congestion in the ski terrain, additional lift capacity could be developed; however, additional lift capacity within the existing SUP area would increase the number of persons on a ski trail, thus increasing skier density on existing trails. As a result, this alternative would not meet the Purpose and Need of maintaining “uncrowded” conditions.

### **2.2.3 CONSTRUCTION OF THE RIDGE ACCESS LIFT P-2 FURTHER TO THE SOUTH ABOVE THE PROPOSED SLUSHMAN LIFT**

This alternative was considered to reduce impacts of P-2 lift construction on the ridge area and responded to the issue of skier safety, which was raised during the scoping process. This alternative was not studied in detail in the 1999 DEIS because of avalanche safety concerns in the southern portion of the Slushman Bowl area and the cliff areas adjacent to the bowl. However, after comments to the 1999 DEIS were received, further study was completed in the Slushman Bowl. The alignment proposed in this SDEIS was found to better address previous construction and avalanche concerns, as well as skier circulation concerns.

### **2.2.4 CONSTRUCTION OF RIDGE ACCESS LIFT P-2 WITHOUT PUBLIC ACCESS**

This alternative was developed to address public concerns regarding additional ridge access by the public, which affects ski quality and safety. The P-2 lift would be constructed, but access

would be restricted to ski patrol for snow safety operations. Impacts to physical and biological resources from this alternative would be the same as the Proposed Action. Because of the similarities of this Alternative to others carried forward, this alternative was not analyzed in detail.

#### **2.2.5 CONSTRUCTION OF THE SLUSHMAN LIFT WITHOUT THE RIDGE ACCESS LIFT P-2**

This alternative would allow the lift and trail development in the Slushman drainage to meet the Purpose and Need for additional diverse terrain, but would not allow for the construction of the P-2 lift. This alternative was considered in response to the issue of increasing terrain in the Slushman area while limiting public access to the ridge. Access to the ridge would continue to be allowed for hike-to backcountry skiers. Avalanche safety would continue as currently managed. This alternative was not studied in detail because it would have been difficult for the ski patrol to access the ridge above the proposed Slushman lift and ski terrain in a timely manner for adequate avalanche hazard reduction work, and the impacts to resources would be very similar to the Proposed Action since no tree clearing would be required for trails servicing the P-2 lift.

#### **2.2.6 CONSTRUCTION OF A CHAIRLIFT TO THE RIDGE**

This alternative considered an aerial chairlift, rather than a surface lift to the ridge to reduce possible resource impacts, responding to vegetation and wildlife issues raised during scoping, and to make skier access to the ridge easier. This alternative was not analyzed further due to the lack of sufficient area at the proposed top terminal for skier unloading without major earthwork on the ridge. Additional concerns included the additional capacity the lift would provide to the ridge, as well as user safety due to high wind on the ridge.

#### **2.2.7 EXPANSION OF THE SKI AREA PERMIT FOR THE SLUSHMAN AND BRADLEY MEADOWS AREAS WITHOUT LIFTS**

This alternative was developed to address the concern of increasing lift-served skiing outside of the current SUP area by allowing the expansion of the SUP area without the construction of lifts. The proposed expansion areas would be accessed by hiking along skier access trails. This alternative was not studied in detail because of snow safety concerns and skier evacuation concerns. Additionally, this alternative did not meet the Purpose and Need for the project, which includes the expansion of lift served skiing opportunities in order to better serve the public demand for less crowded conditions at Bridger Bowl.

### **2.3 MODIFICATIONS TO THE BRIDGER BOWL MDP PROPOSAL**

Since the DEIS was issued in 1999, a number of facility upgrades and improvements have taken place at Bridger Bowl, both on private Bridger Bowl property and NFS lands. All of these recently completed projects have been analyzed as existing conditions in this SDEIS and are also considered in the analysis of cumulative effects. The 1997 Bridger Bowl MDP has been modified to reflect these recent changes and has been re-submitted to the Forest Service as the 2002 MDP. The 2002 MDP was modified in response to public comments from the 1999 DEIS. Therefore, the Proposed Action analyzed in this SDEIS represents the most current version of the

2002 MDP Proposal by Bridger Bowl, Inc. The following text outlines the recent changes to Bridger Bowl and how the 2002 MDP has been modified in response.

Additional changes to the Proposed Action have occurred in response to additional planning and physical and biological analysis undertaken since 2002. The previous 1999 DEIS options for the N-1 and N-2 chairlifts have been reviewed and consolidated into a single lift line that is specified as chairlift N-1 in this SDEIS. The N-2 lift and five associated trails proposed on private land in the 2002 MDP are no longer proposed as a reasonably foreseeable project. Four trails in the N-1 ski pod have been shortened and one trail has been removed from the Proposed Action because connecting trails to N-2 would no longer be necessary. Also, the proposed locations of the bottom terminals of the A-1 and A-2 chairlifts have been moved upslope of their original locations to avoid direct impacts to stream channels. The Proposed P-2 lift has been relocated further south to reduce potential tree clearing impacts and to improve skier circulation. Finally, the forest clearing for ski trail construction originally proposed in the 1999 DEIS has been re-evaluated and modified to reflect more accurate mapping of vegetation, streams, and wetlands within the Study Area.

## **2.4 ALTERNATIVES CONSIDERED IN DETAIL**

### **2.4.1 ALTERNATIVE 1**

Under Alternative 1, there would be no change to the existing SUP or its boundaries, and Bridger Bowl would continue to operate under the conditions of the 40-year SUP that was issued by the Forest Service in November 2002. The existing lifts, ski trails, and facilities at Bridger Bowl would also be maintained in their current condition under Alternative 1. The overall resort CCC of Bridger Bowl would remain unchanged at approximately 3,200 skiers as limited by the capacity of the lifts and terrain. The guest services capacity under existing conditions is 5,400; this is limited by the capacity of the wastewater treatment system and will not change upon completion of the new day lodge. Under Alternative 1, there would be no additional effects on the biological or human environment resulting from development of new facilities. Implementation of Alternative 1 would not meet the Purpose and Need for the Proposed Action; however, it must be analyzed to provide a baseline by which to compare the environmental consequences of the action alternatives. Refer to Figure 2-1 for a graphic representation of Alternative 1.

#### *Lifts*

Under Alternative 1, Bridger Bowl would continue to operate eight ski lifts. Any future lift replacements on NFS lands would require project-specific NEPA analysis and approval from the Forest Service.

#### *Trails*

The existing terrain at Bridger Bowl would be maintained under Alternative 1, including 69 named trails that provide approximately 407 acres of developed ski terrain. The existing trail network would continue to accommodate a range of skier abilities from beginner to expert. It is comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 57.6 acres

of low-intermediate terrain, 113.6 acres of intermediate terrain, 55.7 acres of advanced-intermediate terrain and 81.5 acres of expert terrain.

#### *Mountain Service Roads*

Under Alternative 1, Bridger Bowl would continue to operate its existing network of mountain service roads. The Bridger Bowl Study Area contains approximately 16 total miles of roads on NFS lands, Bridger Bowl private lands, and other private lands. Of this total, 8.6 miles are on NFS lands. No new road construction or obliteration projects would occur. Any future road construction or obliteration projects on NFS lands would require specific Forest Service approval.

#### *Support Facilities*

No new guest service facilities would be constructed on NFS lands under Alternative 1; however, construction of the new day lodge in the base area would continue.





Bridger Bowl EIS

Figure 2-1

Alternative 1 - Existing Conditions

Legend

- Existing Lift
- Existing Road
- Existing Parking Lot
- Existing Building
- Existing Special Use Permit Boundary
- Forest Service Roadless Boundary
- Bridger Canyon Zoning Boundary
- Additional Property Boundaries

Resort Facilities

- A Maintenance Shop (E)
  - B Ski Patrol (E)
  - C New Day Lodge (E)
  - D Jim Bridger Lodge (E)
  - E Access Gate (E)
  - F Drain Fields (E)
  - G Deer Park Chalet (E)
  - H Ski Patrol Cache (E)
  - I Summer Hiking Trail and Raptor Viewing Deck (E)
  - J Hiking Trail #538 (E)
- (E) - Existing

Trail Ability

- Beginner
- Intermediate
- Advanced

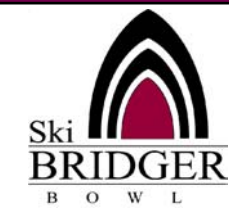
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Bridger Bowl EIS

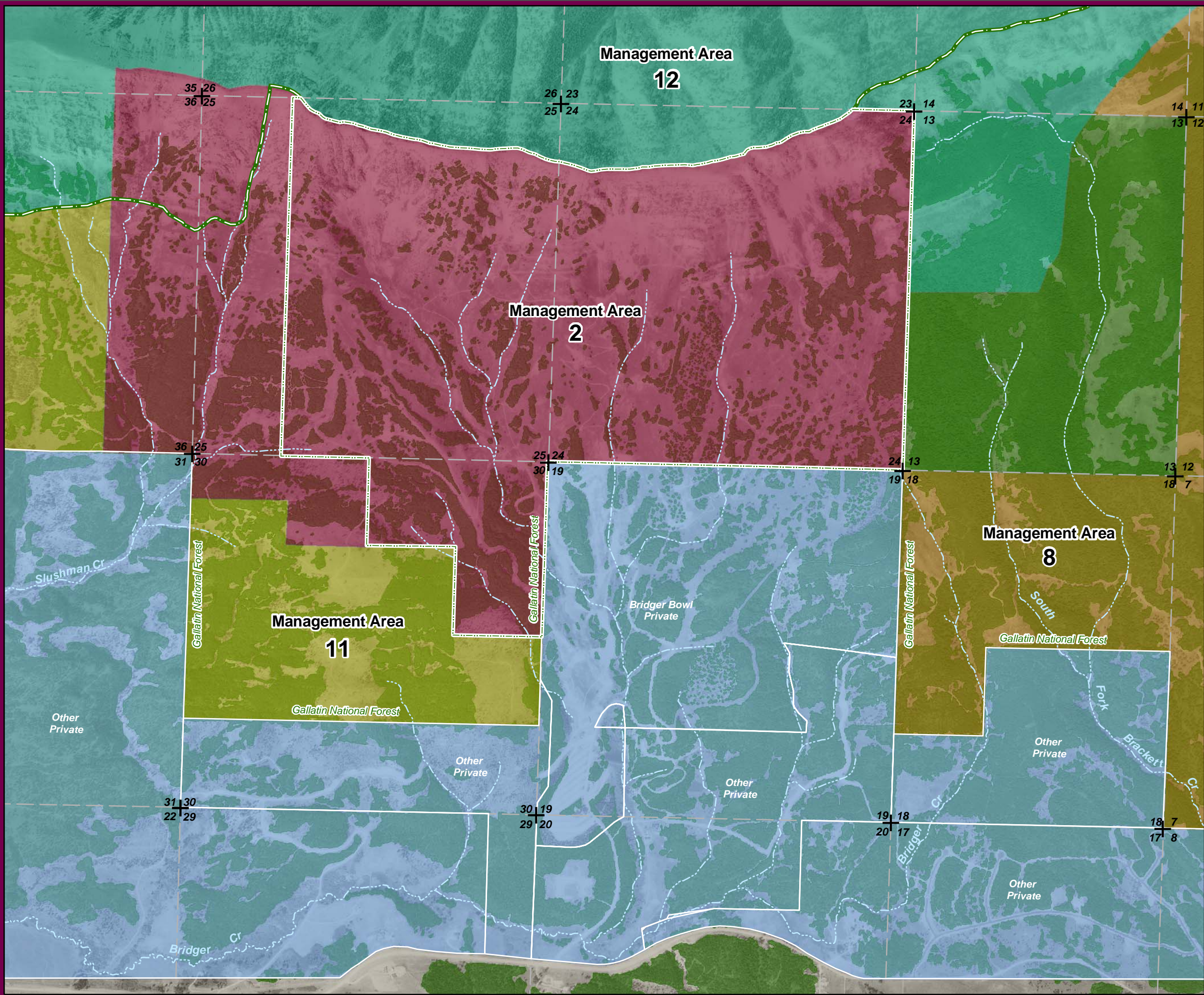
Figure 2-2

Existing Forest Plan Allocations

Legend

Land Allocations of the Gallatin National Forest Plan

- National Forest**  
Forest with no management area designation
- Management Area 2**  
Developed Ski Area
- Management Area 8**  
Timber Emphasis
- Management Area 11**  
Big Game Emphasis / Timber Emphasis
- Management Area 12**  
Big Game Emphasis / Dispersed Recreation
- Private**
- Existing Special Use Permit Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries





## 2.4.2

## ALTERNATIVE 2

Alternative 2 is the Proposed Action as detailed in the 2002 Bridger Bowl MDP. If Alternative 2 is selected by the Forest Service, the 2002 Bridger Bowl MDP would be approved and would serve as the guidance document for the life of the SUP. Under Alternative 2, the guest services capacity would increase to 6,200 upon completion of the Limestone Chalet. However, the capacity of the lifts and terrain would only increase to 6,100, thus limiting the overall resort CCC of Bridger Bowl to 6,100.

In addition, the Bridger Bowl SUP boundary would be expanded to the north by 274 acres to include the Bradley Meadows area above the South Fork of Brackett Creek. The SUP boundary would also be expanded to the south into the Slushman Drainage area for an additional increase of 337 acres. In all action alternatives, the southeast portion of the SUP area would be adjusted to include the gun tower that Bridger Bowl currently uses for avalanche control work within their SUP area. This boundary adjustment would result in a net increase of 45 acres<sup>1</sup> to the Bridger Bowl SUP area. Refer to Figure 2-3 for a graphic representation of Alternative 2.

### **Connected Actions**

Under all action alternatives, additional development on private lands owned by Bridger Bowl could occur at a later time without a requirement for Forest Service approval or NEPA analysis. For purposes of disclosure, these project elements are described here and the effects of these connected actions are described in Chapter 3; however, they are not considered part of Bridger Bowl's site-specific NEPA proposal.

The portion of the Virginia City Lift located on private land is proposed for modification within its existing alignment. Bridger Bowl would shorten the length of the lift line and relocate the bottom terminal uphill to reduce congestion in the base area.

In addition to completion of the new day lodge, the Limestone Chalet is proposed on private lands at the base of the proposed N-1 lift. The Limestone Chalet would be 4,151 square feet in size and would provide 180 additional restaurant seats and 50 deck seats. At a turnover rate of 3.7 people per seat, the Limestone Chalet would accommodate approximately 800 people per day with necessary infrastructure, including an on-site septic system.

An additional 1.5 acres of parking would be constructed adjacent to the existing parking lot on private lands in the base area. The additional parking lot would bring Bridger Bowl parking areas to design capacity as governed by Bridger Canyon zoning restrictions. Although the parking would be constructed on private land, new lots would have a native or gravel surface and be built with appropriate erosion control and drainage provisions.

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<sup>1</sup> The proposed adjustment to the Bridger Bowl SUP area in the vicinity of the gun tower would result in a net increase of 45 acres to the SUP area. This is due to minor adjustments along this edge of the boundary, including the removal of approximately 16.7 acres from the current SUP area and the addition of approximately 61.4 acres for the inclusion of the gun tower. Refer to Figure 2-4 for additional information.

### *Lifts*

Under Alternative 2, Bridger Bowl would operate a total of 13 ski lifts, including 10 chairlifts and three surface lifts (see Figure 2-3). Bridger Bowl would increase the capacity of the lifts and terrain, as demand warrants, from 3,200 to 6,100. Two existing chairlifts would be modified or replaced in their existing alignments; Bridger and Deer Park chairlifts. The Alpine chairlift would be removed, and six new lifts would be constructed; P-2 and P-3 surface lifts; and S-1, A-1, A-2, and N-1 chairlifts.

Bridger Bowl would increase lift and trail capacity as demand warrants, therefore the development projects may be delayed in response to demand and financial considerations.

### *Trails*

Alternative 2 proposes the development of additional ski terrain in both the Bradley Meadows and the Slushman Drainage expansion areas. This would entail the creation of 16 new trails (S-1 through 7 and trails N-1 through 9). Under Alternative 2, the Bridger Bowl trail network would increase by approximately 96 acres to 85 trails on approximately 503 acres. The trail network would accommodate the entire range of skier abilities from beginner to expert, comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 58.6 acres of low-intermediate terrain, 120.5 acres of intermediate terrain, 66.3 acres of advanced-intermediate terrain, and 159 acres of expert terrain.

The 16 proposed trails would be constructed according to the Clearing with No Grading and the No Construction Activities construction techniques described in Section 2.4.5. Timber removal techniques would be consistent with Forest Service Standards and Guidelines. Trail alignments would follow natural fall lines to the greatest extent possible. Edges of the trails would be irregular to simulate natural forest openings consistent with providing a quality skiing experience and meeting visual quality objectives.

### *Mountain Service Roads*

Under Alternative 2, the road network within the study area would increase to a total of 17.7 miles, with 1.4 miles of new road proposed on NFS lands and 0.4 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. In total, eight new road segments would be constructed to facilitate lift construction and maintenance access. Two new road segments would be constructed to the top of the proposed A-2 and N-1 chairlifts, five road segments to the bottom of N-1 (on private lands), A-1, A-2, P-3 and S-1 chairlifts, and one road segment to the bottom of the Limestone Chalet on private land. The roads would meet Forest Service standards and appropriate erosion control and drainage would be installed as described in Appendix D.

### *Utilities*

The increase in on-mountain guest services capacity would be accommodated by the existing wastewater treatment system plus the on-site septic system at the Limestone Chalet; together they would accommodate 6,200 skiers per day. Power for proposed project elements, including the new lifts, would be drawn from existing power lines currently installed for power to chairlifts on existing terrain and would be trenched within existing and proposed mountain access roads.

Additional power, domestic water, and wastewater treatment would be necessary for completion of the Limestone Chalet on adjacent private lands.

#### *Forest Plan Direction and Consistency*

Alternative 2 would require several amendments to the GNF Forest Plan to create and/or maintain consistency with management direction. These four proposed amendments are summarized below and detailed in Appendix C.

- Change the management area designation in the Bradley Meadows area (217.3 acres) from MA 12 (with an emphasis on dispersed recreation and big game habitat) to MA 2 (with an emphasis on winter sports areas). Section 13 was acquired by the Forest Service in 1993 through a land exchange; this area currently has no management area designation. In addition to the change above, approximately 57 acres would also be allocated to MA 2 (Marlenee, 1999). The remainder of Section 13 would be designated to MA 12 to maintain habitat integrity.
- In conjunction with the SUP adjustment for the inclusion of the gun tower, change MA designations along the proposed southeast SUP boundary from MA 11 to MA 2 to ensure that all lands within the SUP area are designated MA 2. This would result in approximately four acres changing to MA 2. Approximately 17 acres would be removed from the SUP area and re-designated MA 11 as part of this proposal.
- In conjunction with the change in management area designation from 12 to 2, the Visual Quality Objective (VQO) for the Bradley Meadows area would also be amended to be consistent with MA 2 direction. As a result, the VQO for this area would change from *Retention* to *Partial Retention*.
- The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and generally encompass an area representative of elk summer range. It requires an HEI rating of at least 0.70. The Proposed Action includes timber compartments 504 and 515. Compartment 504 currently has an HEI of 0.54, while compartment 515 currently has an HEI of 0.50. The HEIs for timber compartments 504 and 515 are both below the minimum standard of 0.70 established in the Forest Plan. While road density would increase within the Study Area, it would not substantially alter the current HEI for compartment 504 or 515; however, a Forest Plan amendment is required to address the current substandard condition and enable the Proposed Action to be consistent with management direction.
- In timber compartment 504, the existing area of old growth is currently below the Forest Plan standard of 10 percent; current conditions only display 7.0 percent old growth within the compartment. Implementation of the Proposed Action would further reduce the percentage of old growth within the compartment from seven to 6.95 with construction of the project elements associated with the N-1 Lift and N trails.





# Bridger Bowl EIS

Figure 2-3

## Alternative 2 - Proposed Action

### Legend

- Existing Lift
- Existing Lift - Modified
- Existing Lift - Removed
- Proposed Lift
- Existing Road
- Proposed Mountain Access Road
- Existing Parking Lot
- Proposed Parking Lot
- Proposed Trail
- Existing Building
- Proposed Building
- Existing Special Use Permit Boundary
- Proposed Special Use Permit Boundary Expansion
- Forest Service Roadless Boundary
- Bridger Canyon Zoning Boundary
- Additional Property Boundaries

### Resort Facilities

- A Maintenance Shop (E)
- B Ski Patrol (E)
- C New Day Lodge (E)
- D Jim Bridger Lodge (E)
- E Access Gate (E)
- F Drain Fields (E)
- G Deer Park Chalet (E)
- H Ski Patrol Cache (E)
- I Summer Hiking Trail and Raptor Viewing Deck (E)
- J Hiking Trail #538 (E)
- K Culverted Stream Crossing (P)
- L Limestone Chalet (P)
- (E) - Existing
- (P) - Proposed

### Trail Ability

- Beginner
- Intermediate
- Advanced

0 700 1400 2800 feet

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Bridger Bowl EIS

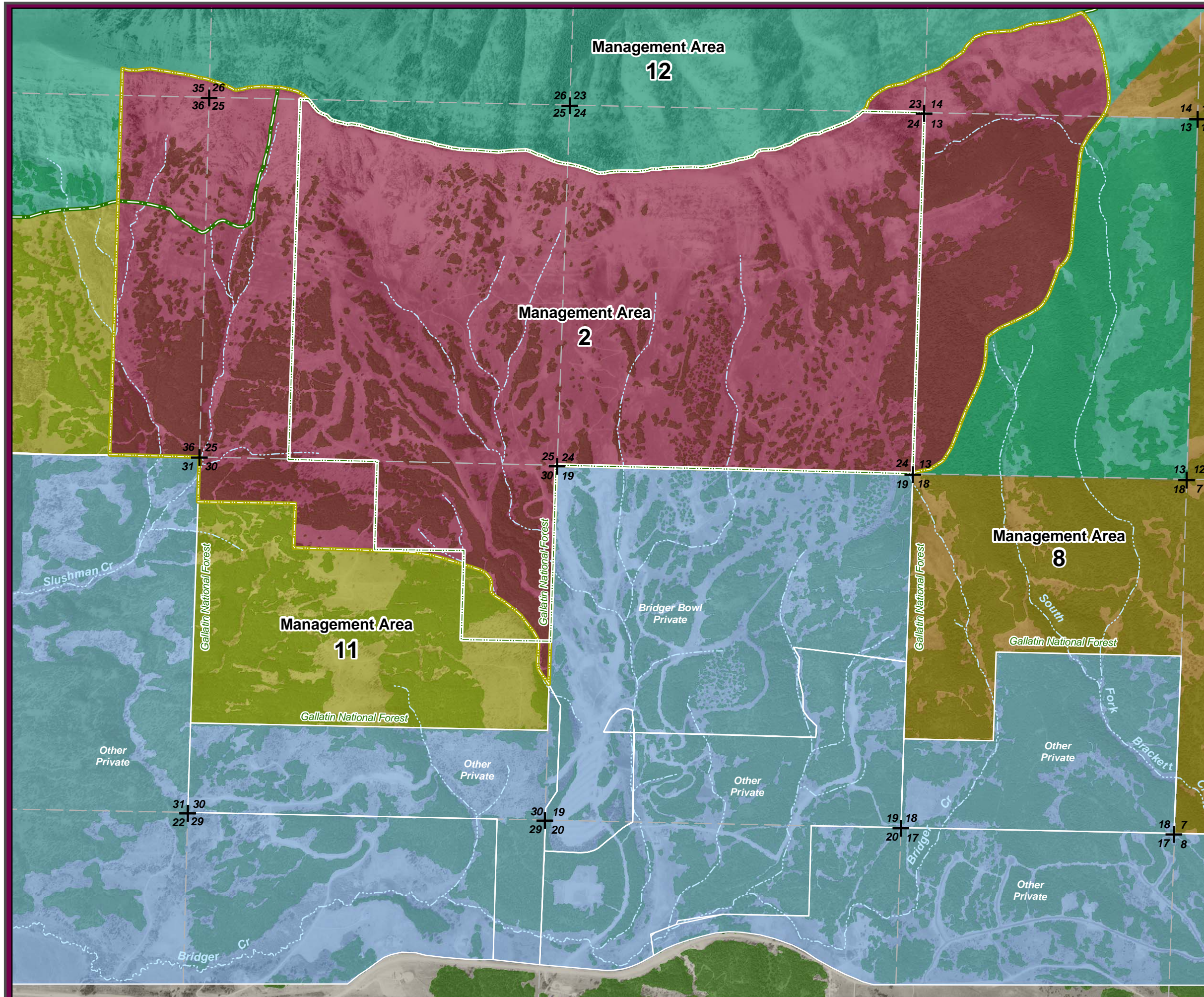
Figure 2-4

Proposed Forest Plan Allocations

Legend

Land Allocations of the Gallatin National Forest Plan

- Management Area 2  
Developed Ski Area
- Management Area 8  
Timber Emphasis
- Management Area 11  
Big Game Emphasis / Timber Emphasis
- Management Area 12  
Big Game Emphasis / Dispersed Recreation
- Private
- Proposed Special Use Permit Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries



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### 2.4.3

### ALTERNATIVE 3

Alternative 3 was developed by the Forest Service to reduce impacts to the Bridger IRAs surrounding Bridger Bowl by eliminating development in the Slushman Drainage area. None of the projects proposed under Alternative 3 would occur in the roadless area. Under Alternative 3, the guest services capacity for Bridger Bowl would increase from 5,400 to 6,200. The SUP area would be expanded by 274 acres to the north to include the Bradley Meadows areas. Expansion of the SUP area into the Slushman Drainage would not occur. The remainder of the project elements under Alternative 3 would be as described under Alternative 2. Refer to Figure 2-5 for a graphic representation of Alternative 3.

#### *Lifts*

Four new lifts would be constructed under Alternative 3; one surface lift (P-3), and three chairlifts (A-1, A-2, and N-1) for a total of 11 lifts. Bridger Bowl would increase the capacity of the lifts and terrain, as demand warrants, from 3,200 to 5,600. The Deer Park and Bridger lifts would be modified or replaced within their existing alignments. Under Alternative 3, the S-1 and P-2 lifts would not be constructed because there would be no expansion into the Slushman Drainage.

#### *Trails*

Alternative 3 proposes the development of nine new trails in the Bradley Meadows area. This would expand the developed trail network by approximately 52 acres for a total of 459 acres. The proposed trail network would have 78 developed trails, which would accommodate the entire range of skier abilities from beginner to expert. This would be comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 58.6 acres of low-intermediate terrain, 120.5 acres of intermediate terrain, 66.3 acres of advanced-intermediate terrain, and 114.4 acres of expert terrain.

#### *Mountain Service Roads*

Under Alternative 3, the road network within the study area would increase to a total of 17 miles, with 0.8 miles of new road proposed on NFS lands and 0.3 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. Seven new road segments would be constructed to facilitate summer lift construction and maintenance access. Two new road segments would be constructed to the top of the proposed A-2 and N-1 chairlifts, four road segments to the bottom of N-1 (on private lands), A-1, A-2, and P-3 chairlifts, and one road segment to the bottom of the proposed Limestone Chalet. The roads would meet Forest Service standards, and appropriate erosion control and drainage would be installed according as described in Appendix D.

#### *Support Facilities*

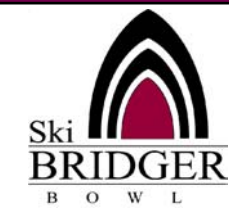
The guest support facilities at Bridger Bowl would be the same under Alternative 3 as proposed under Alternative 2. Bridger Bowl would continue to operate the Jim Bridger Lodge and the Deer Park Chalet, as well as the new day lodge once it is completed.

## *Forest Plan*

Alternative 3 would require several amendments to the GNF Forest Plan to create and/or maintain consistency with management direction. These four proposed amendments are summarized below and detailed in Appendix C.

- Change the management area designation in the Bradley Meadows area (217.3 acres) from MA 12 (with an emphasis on dispersed recreation and big game habitat) to MA 2 (with an emphasis on winter sports areas). Section 13 was acquired by the Forest Service in 1993 through a land exchange; this area currently has no management area designation. In addition to the change above, approximately 57 acres would also be allocated to MA 2 (Marlenee, 1999). The remainder of Section 13 would be designated to MA 12 to maintain habitat integrity.
- In conjunction with the SUP adjustment for the inclusion of the gun tower, change MA designations along the proposed southeast SUP boundary from MA 11 to MA 2 to ensure that all lands within the SUP area are designated MA 2. This would result in approximately four acres changing to MA 2. Approximately 17 acres would be removed from the SUP area and re-designated MA 11 as part of this proposal.
- In conjunction with the change in management area designation from 12 to 2, the Visual Quality Objective (VQO) for the Bradley Meadows area would also be amended to be consistent with MA 2 direction. As a result, the VQO for this area would change from *Retention* to *Partial Retention*.
- The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and generally encompass an area representative of elk summer range. It requires an HEI rating of at least 0.70. The Proposed Action includes timber compartments 504 and 515. Compartment 504 currently has an HEI of 0.54, while compartment 515 currently has an HEI of 0.50. The HEIs for timber compartments 504 and 515 are both below the minimum standard of 0.70 established in the Forest Plan. While road density would increase within the Study Area, it would not substantially alter the current HEI for compartment 504 or 515; however, a Forest Plan amendment is required to address the current substandard condition and enable the Proposed Action to be consistent with management direction.
- In timber compartment 504, the existing area of old growth is currently below the Forest Plan standard of 10 percent; current conditions only display 7.0 percent old growth within the compartment. Implementation of the Proposed Action would further reduce the percentage of old growth within the compartment from seven to 6.95 with construction of the project elements associated with the N-1 Lift and N trails.





Bridger Bowl EIS

Figure 2-5

Alternative 3

Legend

- Existing Lift
- Existing Lift - Modified
- Existing Lift - Removed
- Proposed Lift
- Existing Road
- Proposed Mountain Access Road
- Existing Parking Lot
- Proposed Parking Lot
- Proposed Trail
- Existing Building
- Proposed Building
- Existing Special Use Permit Boundary
- Proposed Special Use Permit Boundary Expansion
- Bridger Canyon Zoning Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries

Resort Facilities

- A Maintenance Shop (E)
- B Ski Patrol (E)
- C New Day Lodge (E)
- D Jim Bridger Lodge (E)
- E Access Gate (E)
- F Drain Fields (E)
- G Deer Park Chalet (E)
- H Ski Patrol Cache (E)
- I Summer Hiking Trail and Raptor Viewing Deck (E)
- J Hiking Trail #538 (E)
- K Limestone Chalet (P)
- (E) - Existing
- (P) - Proposed

Trail Ability

- Beginner
- Intermediate
- Advanced

0 700 1400 2800 feet

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#### 2.4.4 ALTERNATIVE 4

Alternative 4 was developed by the Forest Service to reduce potential impacts to wildlife and old growth forest by eliminating development in the Bradley Meadows area. Under Alternative 4, the guest services capacity for Bridger Bowl would increase from 5,400 to 6,200 as demand warrants with proposed expansions and upgrades, the same as in Alternatives 2 and 3. In addition, the Bridger Bowl SUP boundary would be expanded to the south by 337 acres to include the Slushman Drainage area. Expansion of the SUP area into the Bradley Meadows area would not occur. Refer to Figure 2-6 for a graphic representation of Alternative 4.

##### *Lifts*

Similar to Alternative 3, Bridger Bowl would operate 11 ski lifts, including nine chairlifts and two surface lifts under Alternative 4. Bridger Bowl would increase the capacity of the lift and trail system to 5,100. Four new lifts would be constructed under Alternative 4; one surface lift (P-2), and three chairlifts (A-1, A-2, and S-1). The replacement and/or modification of two existing lifts (Deer Park and Bridger) would be as described under Alternative 2. Under Alternative 4, the proposed N-1 and P-3 lifts would not be constructed because there would be no expansion into the Bradley Meadows area.

##### *Trails*

Alternative 4 proposes to develop seven new trails in the Slushman Drainage area, which would expand the developed trail network by approximately 45 acres for a ski area total of approximately 452 acres. The trail network would have 76 trails, which would accommodate a range of skier abilities from beginner to expert. This would be comprised of approximately 1.4 acres of beginner terrain, 97.2 acres of novice terrain, 57.6 acres of low-intermediate terrain, 113.6 acres of intermediate terrain, 55.7 acres of advanced-intermediate terrain, and 126.1 acres of expert terrain.

##### *Mountain Service Roads*

Under Alternative 4, the road network within the study area would increase to a total of 17.1 miles, with 0.9 miles of new road proposed on NFS lands and 0.3 miles of new road proposed on private lands. All new roads would have a natural native surface and would be used to access lift terminals for summer maintenance and construction. In total, five new road segments would be constructed to facilitate lift construction and summer maintenance access. One new road segment would be constructed to the top of the proposed A-2 chairlift, three road segments to the bottom of A-1, A-2, and S-1 chairlifts, and one road segment to the bottom of the proposed Limestone Chalet. The roads would meet Forest Service standards, and appropriate erosion control and drainage would be installed as described in Appendix D.

##### *Support Facilities*

Under Alternative 4, the guest support facilities at Bridger Bowl would be the same as proposed under Alternative 2. Bridger Bowl would continue to operate the Jim Bridger Lodge and the Deer Park Chalet, as well as the new day lodge once it is completed.

### *Forest Plan*

Only one Forest Plan amendment would be required under Alternative 4; this is relative to the boundary adjustments made to accommodate the gun tower. Approximately 17 acres of land would be removed from the SUP and re-designated MA 11, while another 4 acres would be added to the SUP area and designated MA 2. The remainder of the lands in the proposed Slushman Drainage expansion area is already MA 2, and the current SUP would be amended to expand the SUP to include approximately 337 acres to the south of the existing SUP, within the Slushman drainage basin.





Bridger Bowl EIS

Figure 2-6

Alternative 4

Legend

- Existing Lift
- Existing Lift - Modified
- Existing Lift - Removed
- Proposed Lift
- Existing Road
- Proposed Mountain Access Road
- Existing Parking Lot
- Proposed Parking Lot
- Proposed Trail
- Existing Building
- Proposed Building
- Existing Special Use Permit Boundary
- Proposed Special Use Permit Boundary Expansion
- Bridger Canyon Zoning Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries

Resort Facilities

- A Maintenance Shop (E)
  - B Ski Patrol (E)
  - C New Day Lodge (E)
  - D Jim Bridger Lodge (E)
  - E Access Gate (E)
  - F Drain Fields (E)
  - G Deer Park Chalet (E)
  - H Ski Patrol Cache (E)
  - I Summer Hiking Trail and Raptor Viewing Deck (E)
  - J Hiking Trail #538 (E)
  - K Culverted Stream Crossing (P)
  - L Limestone Chalet (P)
- (E) - Existing  
(P) - Proposed

Trail Ability

- Beginner
- Intermediate
- Advanced

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## 2.4.5

## ASSUMPTIONS COMMON TO ALL ALTERNATIVES

### *Capacity*

The single most important parameter considered when planning guest support facilities at ski areas is the Comfortable Carrying Capacity (CCC). The CCC of a ski area is the number of skiers an entire resort can comfortably accommodate at any given time and still guarantee a pleasant recreation experience. A resort's CCC does not reflect the number of skiers on the mountain at one time. Rather, 70 to 85 percent of a mountain's total CCC are active skiers, including those on the trails, riding lifts, and waiting in lift lines. The remaining 15 to 30 percent are using guest service facilities or milling in areas near these facilities.

The calculation of the overall CCC of Bridger Bowl was based on capacities associated with the lift and trail network, support facilities (e.g., restaurant seats, sewage treatment plant, etc.), and parking. By definition, the calculated ski area CCC can not exceed the capacity of any of the major facility groups in the ski area (e.g., lift and trail capacity, restaurant capacity, parking capacity, etc.). The lift and trail capacity was determined using parameters such as uphill lift capacity, trail skier densities, trail acreage and capacity, lift type, hours of operation, and other planning parameters. The capacity of Bridger Bowl guest services was determined by evaluating the capacities of all support facilities in the base area, including parking. The ski area CCC does not consider previous skier visits, nor does it predict future visitation of the resort. The ski area CCC is a planning parameter by which other skier services can be designed. For example, the capacity of parking spaces, restaurant seats, utilities and infrastructure must be designed to accommodate the CCC for the ski area to operate efficiently. The overall balance of the existing ski area is evaluated by calculating the capacities of the resort's various facilities, as compared to the resort's CCC.

### *Skier Ability*

As used in this SDEIS, skier ability levels are defined based on the slope gradient of the ski trail, as shown in Table 2.4-1.

**Table 2.4-1**  
**Slope Gradient by Ability Level**

Skier Ability Level	Acceptable Slope Gradient (percent)
Beginner	8 to 12
Novice	12 to 25 (short pitches of 30)
Low Intermediate	25 to 30 (short pitches of 35)
Intermediate	30 to 40 (short pitches of 45)
Advanced Intermediate	40 to 50 (short pitches of 55)
Expert	over 50 (maximum of 80)

Source: SE Group

### *Construction*

Many of the direct effects analyzed in this SDEIS are related to the development of the proposed lifts and associated ski trails. The degree of environmental impacts associated with lift and trail construction varies considerably and is dependant on the type and location of construction techniques proposed. Assumptions for the amount of clearing and grading that would occur for specific activities proposed in the Action Alternatives are shown in Table 2.4-2. For analysis

purposes in this SDEIS, clearing widths and areas are considered “worst-case” assumptions. The final layout of lift and ski trail construction locations will be refined in the field during construction implementation. Therefore, actual disturbance from construction would not exceed the stated disturbance area and will likely be less.

**Table 2.4-2  
Grading Assumptions for the Bridger Bowl MDP Proposal**

<b>Project Component</b>	<b>Grading Assumption</b>
<b>Chairlift</b>	
Top Terminal Ground Disturbance	0.3 acre
Bottom Terminal Ground Disturbance	0.6 acre
<b>Surface Lift</b>	
Lift Terminal Ground Disturbance	0.1 acre
<b>Service Roads</b>	
Road Surface Width	20 feet
Ground Disturbance Width	30 feet
<b>Other Facilities</b>	
Buildings <sup>a</sup>	50-foot corridor
Parking Lot Expansion <sup>b</sup>	15-foot corridor

<sup>a</sup>“Worst case” estimate of clearing, grading, machinery operation, storage of spoils, etc.

<sup>b</sup> Represents a construction corridor surrounding the development footprint.

Four categories of construction techniques have been defined in order to provide an accurate analysis of the environmental impacts associated with this proposal. These construction techniques are used to characterize the impacts from all components of this proposal; they include construction of ski trails, lift terminals and towers, utilities (e.g., power, sewer, etc.), buildings, roads, and parking lots. The construction techniques for this proposal are as follows:

- **No Construction Activities:** Due to the large number of alpine meadows and the open nature of the alpine forests at Bridger Bowl, many of the proposed ski trails would require no construction activities to provide safe skiing. Proposed ski trails with no construction activities proposed would not cause direct impacts to resources. As a result, impact area calculations for this construction technique are not included in this analysis.
- **Clearing with No Grading:** This construction technique involves the removal of all trees within the proposed construction limits. Trees would be cut flush to the ground and stumps would not be removed. The soil surface would not be graded and the natural ground cover would be maintained. Downed timber would be removed over the snow to avoid ground disturbance. Merchantable timber would be decked within previously disturbed areas adjacent to existing roads. Slash and unmerchantable timber would be lopped and scattered or stacked and burned in accordance with Forest Service and State of Montana regulations. Tracked excavator equipment and/or explosives may be used in limited circumstances to remove rock outcrops, and some individual stumps.

- **Grading with No Clearing:** This technique would be used for the development of proposed buildings and lift terminals in non-forested areas where tree clearing would not be required. This technique would involve grading the soil surface for road construction and/or excavation of footings for buildings and lifts. Grading may include the use of explosives for the removal of bedrock or large boulders, or the use of excavators and bulldozers for earthmoving. After grading is complete, the soil surface would be revegetated, where appropriate, according to the Mitigation Measures in Table 2.6-1.
- **Grading with Clearing:** In this technique, all trees would be removed within the construction limits, stumps would be removed, and the surface would be graded. Grading would occur for parking lot and road construction and excavation of footings for buildings and lifts. Grading may include the use of explosives for the removal of bedrock or large boulders, or the use of excavators and bulldozers for earthmoving. After grading is complete, the soil surface would be revegetated, where appropriate, according to the Mitigation Measures in Table 2.6-1. The removal of felled trees would be accomplished with skidders or over the snow. Merchantable timber would be decked within previously disturbed areas adjacent to existing roads. Slash and unmerchantable timber would be lopped and scattered or piled and burned in accordance with Forest Service and State of Montana regulations.

Standard construction techniques would be used for building lift terminal structures. Lift tower footings would be excavated by track hoes or specialized construction machinery except in areas not easily accessible. In this case, footings would be constructed with hand-held tools. Concrete for footings and lift towers would be flown in by helicopter in situations where it could not be transported on the ground using existing and proposed roads. Standard and site-specific BMPs as well as mitigation measures would be implemented before and after construction.

In addition to the construction techniques outlined above, ski trail clearing would include edge treatments that are intended to reduce the visual impacts of trail clearing and to enhance the skiing opportunities along the trail edge. These prescriptions include:

- **Forest Edge Scalloping:** Creating a ski trail boundary to resemble an irregular sine wave to reduce visual impacts associated with straight trail edges. The limit of clearing boundary would not exceed a maximum distance of 30 feet inside or outside of the original planned trail edge.
- **Forest Edge Feathering:** Selectively removing trees along the limit of clearing boundary where appropriate, so that a hard line in the new trail-to-forest transition is not evident. The area to be thinned for forest edge feathering would be approximately 10 to 30 feet wide. Large trees would be selectively removed starting at the limit of clearing boundary, so that the tree density would decrease from the undisturbed forest to the ski trail boundary.

## 2.5 SUMMARY COMPARISON OF ALTERNATIVES

Table 2.5-1 presents a summary comparison of the alternatives, while Table 2.5-2 compares the environmental consequences of each alternative throughout the Study Area, which is approximately 2,574 acres. A detailed analysis of the environmental consequences of each alternative is presented in Chapter 4 of this SDEIS.

**Table 2.5-1**  
**Summary Comparison of Bridger Bowl Facilities by Alternative**

<b>MDP Components</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
<b>SUP area (acres)<sup>a</sup></b>	1,122	1,778	1,441	1,504
<b>Ski Area Capacity (CCC)</b>	3,200	6,100	5,600	5,100
Guest Services Capacity	5,400	6,200	6,200	6,200
Lift and Terrain Capacity	3,200	6,100	5,600	5,100
<b>Lifts</b>				
Total Number of Lifts	8	13	11	11
<b>Trails</b>				
Total Number of Trails	69	85	78	76
<b>Trail Distribution by Ability Level</b>				
Beginner and Novice (acres)	99	99	99	99
Intermediate (acres)	227	245	245	227
Expert (acres)	81	159	114	126
Total (acres)	407	503	459	452
<b>Roads</b>				
Total miles within study area	15.9	17.7	16.9	17.0
Total miles on NFS lands	8.6	10	9.4	9.5
<b>Food Service</b>				
Total Number of Seats	1,430	1,610	1,610	1,610

<sup>a</sup> The SUP states that the permitted area is 1,042 acres in size. Based on analysis of the SUP area using GIS software, the SUP area is 1,122 acres in size. The updated GIS area of 1,122 acres was used in calculations for all proposed project elements.

**Table 2.5-2**  
**Summary Comparison of Potential Effects by Alternative within the Study Area**

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Geology and Soil Resources</b>				
<i>Impacts to Soil Resources</i>				
Temporary Soil Impacts (ac.)	0.0	+57.3	+50.0	+19.5
Permanent Soil Impacts (ac.)	62.0	+7.0	+5.3	+5.4
<b>Total Soil Impacts (ac.)</b>	<b>62.0</b>	<b>+64.3</b>	<b>+55.3</b>	<b>+24.9</b>
<i>Sediment Yield to Streams</i>				
SF Brackett (tons/yr.)	89.8	+1.6	+1.6	+0.0
Upper Bridger (tons/yr.)	161.2	+3.5	+3.5	+2.4
Maynard (tons/yr.)	63.7	+2.5	+2.5	+1.3
Slushman (tons/yr.)	100.0	+1.5	+0.0	+1.5
<b>Totals (tons/yr.)</b>	<b>414.7</b>	<b>+9.1</b>	<b>+7.6</b>	<b>+5.2</b>
<b>Water Resources</b>				
<i>Road Characteristics</i>				
Road Network (mi.)	15.9	+1.8	+1.0	+1.1
Road Network Density (mi/mi <sup>2</sup> )	4.0	+0.4	+0.3	+0.3
Perennial Stream Crossings	5	+1	0	+1
Intermittent Stream Crossings	24	0	0	0
<i>Wetland Impacts</i>				
Impacts from Grading(ac.)	0.0	0	0	0
Impacts from Clearing (ac.)	0.0	-0.48	-0.48	0
<b>Total (acres)</b>	<b>0.0</b>	<b>-0.48</b>	<b>-0.48</b>	<b>0</b>
<b>Vegetation (Forest Cover)</b>				
Old Growth Forest Impacts (ac.)	182.9	-17.1	-17.1	-0.1
Mature Forest Impacts (ac.)	603.0	-26.1	-23.1	-7.6
Immature Forest Impacts (ac.)	184.6	-2.6	-0.5	-2.1
<b>Total Forest Cover Impacts (ac.)</b>	<b>970.5</b>	<b>-45.8</b>	<b>-41.3</b>	<b>-9.8</b>
Non-forest Cover Impacts	1,542.7	-13.2	-10.9	-9.5
<b>Total Vegetation Impacts (ac.)</b>	<b>2,513.2<sup>a</sup></b>	<b>-59.0</b>	<b>-51.6</b>	<b>-19.3</b>
<b>Wildlife</b>				
<i>Impacts to T &amp; E Species</i>				
Gray wolf	No Effect	No Effect	No Effect	No Effect
Bald Eagle	No Effect	No Effect	No Effect	No Effect
Grizzly bear	No Effect	No Effect	No Effect	No Effect
Canada lynx	No Effect	Likely to adversely affect lynx habitat.	Likely to adversely affect lynx habitat.	May affect, not likely to adversely affect individuals .
<i>Impacts to R1 Sensitive Species</i>	No effect	May impact individuals of certain species .	May impact individuals of certain species .	May impact individuals of certain species .
<i>Impacts to Game Species</i>	No effect	May impact individuals of certain species .	May impact individuals of certain species .	May impact individuals of certain species .



Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Fisheries</b>				
Impacts to Special-Status and T&E Listed Species	No Effect	No Effect	No Effect	No Effect
<b>Inventoried Roadless Areas</b>				
Impacts to IRAs	No Change	New SUP would include 101 acres of the IRA. No new roads would be built, 1.4 acres of trees would be cleared, and 0.7 acres of grading would take place in the IRA.	No Change	New SUP would include 101 acres of the IRA. No new roads would be built, 1.4 acres of trees would be cleared, and 0.7 acres of grading would take place in the IRA.
Impacts to Wilderness Characteristics	No Change	Lift & trails would reduce natural appearance of area. Level of solitude & remoteness would be diminished.	No Change	Lift & trails would reduce natural appearance of area. Level of solitude & remoteness would be diminished.
<b>Air Quality</b>				
	Compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.	Continued compliance with state and Federal regulations.
<b>Visual Resources</b>				
	Consistent with the VQO of Partial Retention assigned to the SUP area as viewed from BCR.	Expansion of SUP boundary to the north and change from MA 12 to MA 2 in this area would result in a change of VQO designation from Retention to Partial Retention. Consistent with assigned VQO when viewed from BCR.	Expansion of SUP boundary to the north and change from MA 12 to MA 2 in this area would result in a change of VQO designation from Retention to Partial Retention. Consistent with assigned VQO when viewed from BCR.	Would remain consistent with the VQO of Partial Retention assigned to the SUP area as viewed from BCR.
<b>Cultural Resources</b>				
	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.	No impacts to NHRP-eligible resources.
<b>Socio-Economic Resources</b>				
Environmental Justice	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.	No disproportionate impacts to minority or low-income populations.

<sup>a</sup> Total vegetation cover does not equal the Study Area size because there are approximately 64 acres of open water and developed land that are not vegetated within this area.

## 2.6

## MITIGATION MEASURES

NEPA and CEQ regulations require identification of all relevant, reasonable mitigation measures that could reduce the impacts of the project, even if those measures are outside the jurisdiction of the Forest Service. Therefore, the following list of mitigation measures are proposed for all of the action alternatives (i.e., alternatives 2, 3, and 4) to minimize and/or avoid impacts to resources or to enhance resource functions. These mitigation measures are specific to this project proposal and would enable implementation of project elements to meet the purpose and need in Chapter 1, while addressing resource issues. These mitigation measures would be incorporated into the project design and be included as permit or contract requirements. Local governments and state and federal agencies may require additional mitigation measures as conditions of permits.

**Table 2.6-1**  
**Mitigation Measures**

Reference Code	Mitigation Measure Description
<b>Vegetation Management</b>	
<b>VM-1</b>	Machine harvest or ground based yarding of trees will not occur on slopes greater than 35% unless the soil is frozen and/or covered by more than six inches of snow.
<b>VM-2</b>	Any unplanned skid trails or roads will be approved by the Forest Service prior to construction.
<b>VM-3</b>	To the extent possible, avoid placing any heavy machinery in wetlands. If heavy machinery needs to operate on wetland sites with saturated soils or standing water, provide pads (such as plywood) under the machinery that would be capable of supporting it from sinking into the soil surface.
<b>VM-4</b>	Where tree clearing in wetlands is unavoidable, the shrub component understory will be maintained in order to provide root systems necessary for stability and sediment filtration. Mechanical trimming of shrubs for skier safety would be allowed to the degree that their vigor and survival are maintained.
<b>VM-5</b>	Pre-project surveys will be conducted in and adjacent to areas to be disturbed for any new plant species added to the Forest Service Sensitive Plant Species list after the publication of this document as directed by a Forest Service biologist.
<b>VM-6</b>	Minimize the amount of vegetation manipulation in sensitive areas such as wetlands, stream environments, and important wildlife habitat features. Ski trails should avoid wetlands or cross as little wetlands as possible.
<b>Riparian Area Protection</b>	
<b>RP-1</b>	No tree clearing for ski trail construction is proposed in SMZs; however, one road crossing is proposed in alternatives 2 and 4. The road will cross the stream as close to perpendicular to the stream as possible. A 310 permit is required from the Gallatin Soil Conservation District for culverts installation in perennial streams.
<b>Revegetation</b>	
<b>RV-1</b>	All disturbed areas that have been regraded and re-topsoiled will be revegetated as soon as possible. All grass seed shall be free from noxious weeds. Seed shall be delivered to the site in sealed containers (bags) with the dealer's guaranteed analysis and blue tagged certification.
<b>RV-2</b>	Revegetated areas will be monitored at least every year by Bridger Bowl until the fifth year to ensure that monitoring performance standards are met. Monitoring will include both qualitative and quantitative approaches to assess the success of all runoff and erosion control measures and revegetation efforts. In addition, monitoring will take place after each spring during the peak of the snowmelt cycle (see Appendix D for detailed monitoring guidelines).

<b>Reference Code</b>	<b>Mitigation Measure Description</b>
<b>Streambank Protection</b>	
<b>SP-1</b>	Human created debris accumulations will be removed from streams to prevent reductions in stream channel stability and capability.
<b>SP-2</b>	Fertilizer application will be minimized in stream management zones (i.e., road or trail crossings). Manufacturer recommendations will be followed for minimum distances from water.
<b>SP-3</b>	Log landing and decking areas will be located out of the stream management zones.
<b>Wildlife</b>	
<b>W-1</b>	Helicopters may not fly above or land on the ridge from September 1 through October 31 to avoid disturbance to migrating raptors unless approved by the Bozeman District Ranger.
<b>W-2</b>	Wolverines and other scavengers may be attracted to human food sources such as garbage, which can result in mortality due to control of nuisance animals. Sanitation measures will be implemented by Bridger Bowl to prevent unwanted wildlife visitations to ski area facilities.
<b>W-3</b>	Due to the change in Management Area designation in the Bradley Meadows area from MA 12 to MA 2, the remaining portion of Section 13 will be designated MA 12 to maintain habitat integrity.
<b>W-4</b>	South Fork Brackett Creek Drainage will be precluded from motorized use to maintain habitat security.
<b>W-5</b>	If construction activities within and adjacent to streams and wetlands are scheduled to occur between June 1 – August 15, pre-construction surveys will be performed by a Forest Service approved wildlife biologist to determine if the streams and wetlands are being used by boreal toads for breeding and rearing. If boreal toads are observed appropriate BMPs will be developed by the Forest Service to minimize the potential for construction impacts during the June 1 – August 15 timeframe.
<b>Cultural Resources</b>	
<b>CR-1</b>	The project contractors are required to temporarily halt ground disturbing activities and notify the District Ranger in the event that subsurface cultural evidence or historical sites are encountered during project construction. An archaeologist will determine the significance of the materials and specify mitigation measures.
<b>Air Quality</b>	
<b>AQ-1</b>	All grading areas, including roadways, buildings, and lift terminal areas, will be sufficiently watered to prevent excessive amounts of dust. In the absence of natural precipitation, watering of these areas will occur at least daily with complete coverage.



# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 3

### The Affected Environment



Gallatin National Forest  
Bozeman Ranger District

## **3.0 THE AFFECTED ENVIRONMENT**

### **3.1 INTRODUCTION**

This chapter describes the existing physical, biological, social, and economic environment, which may be affected by the Proposed Action and the alternatives. These existing conditions are described according to two broad categories. The physical and biological environment includes natural factors such as air quality, water resources, wildlife and fisheries, and visual resources. The human environment includes human-influenced factors such as heritage resources, recreation, and socio-economics.

#### **3.1.1 STUDY AREA**

The Study Area for the analysis contained in this SDEIS varies according to the resource being analyzed. Generally speaking, the analysis performed for the physical and biological environment was conducted within a common Study Area that is 2,574 acres in size.<sup>1</sup> This Study Area includes the current SUP area, those NFS lands proposed for SUP area expansion, and the private lands within and adjacent to the Bridger Bowl. The scope of the Study Area is increased for specific resources in order to address direct, indirect, and cumulative effects (e.g., wide ranging wildlife species, transportation impacts, and air quality impacts).

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<sup>1</sup> Area totals may not agree precisely with the Study Area size of 2,574 acres due to rounding.

## **3.2 GEOLOGY AND SOIL RESOURCES**

### **3.2.1 GEOLOGY**

The Bridger Bowl Study Area for the soils analysis encompasses 2,574 acres and is located in the Bridger Mountain Range. The Study Area is dominated by east facing, steep to moderately steep slopes, which originated from the uplift of the Livingston Group and Fort Union formation. The Fort Union formation, which is underlain by the Livingston Group, is composed of sandstone and a conglomerate of alternating siltstone and mudstone. Uplift of the Bridger Range exposed sedimentary rocks from the early Paleozoic through the late Cretaceous periods. These moderately steep to steep slopes are a thick series of fractured and terraced sandstone, tuff, mudstone, and shale.

Soils in this area develop primarily from landslide debris, which area derived from inter-bedded shale, weathered sandstone, and weathered limestone bedrock. Landslide debris soils are moderately fine textured, with few to many rock fragments. Soils developed from weathered sandstone and shale are moderately fine to medium textured. Limestone weathering within the Study Area creates shallow soils with coarse to moderately coarse texture.

### **3.2.2 SOILS**

The soils in the Bridger Range vary with regard to slope, soil texture, amount of rock fragments, depth, and parent material. Three soil formation areas are distinct within the 2,574 acre Study Area and are defined by Upland Slopes, Ridges, and Toe of Slope.

Soils in the Upland Slope group are the most common group in the Study Area; they are derived from sedimentary rocks and occur in the terraced uplands, ranging from high to lower elevations. These soils occur in strongly sloping to steep areas, ranging from midslopes to foothills. The dominant soil texture in this group is moderately-fine or fine and is commonly classified as clay loam, silty clay loam, or clay.

Soils that comprise the Ridge group are typically shallow soils that are derived from sandstone parent material. These soils contain a high percentage of rock fragments and are typically well drained sandy loam and highly erodible.

Soils found in the Toe of Slope group are usually very deep with buried horizons containing varying amounts of rock. These soils are typically well drained and form over shale and sandstone parent material. These soils have primarily developed from alluvial outwash and the accumulation of landslide debris derived from inter-bedded sandstone, shale, and weathered limestone. Soils that form from slide debris vary in texture from moderately fine to coarse.

The soil types identified below in Table 3.2-1 are known to occur within the Study Area based on Forest Service soils mapping contained in a Geographic Information System (GIS) database. The soil attributes recorded in the GIS database include percent slope, elevation, erosion hazard, texture, and parent material. A numbered code was used by the Forest Service to label and discuss soil properties. No soils data is available for the approximately 138 acres of private land east of the Bridger Bowl parking lot because this area was not mapped by the Forest Service.

**Table 3.2-1**  
**Existing Soil Types within the Bridger Bowl Study Area**

<b>Soil Type</b>	<b>Area (acres)</b>
25-3A – Medium texture	30.6
71-1D - Fine texture	769.9
84-2B - Moderately fine texture	1.4
86-3B - Moderately fine texture	262.5
87-1A - Moderately coarse texture	508.9
87-1B - Moderately coarse texture	2.8
87-2D - Moderately fine texture	255.1
87-2E - Moderately fine texture	54.3
91-2B - Moderately fine texture	422.9
93-1A - Coarse texture, bedrock	127.7
Unclassified	137.9
<b>Total</b>	<b>2574.0</b>

Source: Forest Service

## Soil Types

- 87-1A occurs on 40 percent plus slopes at elevations ranging from 7,800-8,800 feet. It is highly erodible with a moderately coarse texture originating from overthrust limestone with some sedimentary rock parent material.
- 93-1A occurs on 20-40 percent slopes at elevations ranging from 7,000-9,800 feet. It is highly erodible with a coarse to very coarse texture. The parent material is colluvium rock/talus with undifferentiated material
- 71-1D occurs on 0-20 percent slopes at elevations ranging from 7,000-8,000 feet. It is a moderately erodible soil with fine texture originating from mass wasting deposits of weathered soft sedimentary rocks.
- 87-2D occurs on 40 percent plus slopes at elevations ranging from 6,500-8,000 feet. It is a moderately erodible soil with moderately fine texture. The parent material is a mixture of folded and faulted sedimentary rocks including sandstone shale and limestone.
- 87-2E occurs on 40 percent plus slopes at elevations ranging between 8,000-8,800 feet. It is a moderately erodible soil with moderately fine texture. The parent material is a mixture of folded and faulted sedimentary rocks including sandstone shale and limestone
- 91-2B occurs on 10-20 percent slopes at elevations ranging from 7,800-8,500 feet. It has a low erodibility and a moderately fine texture. The parent material is soft sedimentary rock.

- 86-3B occurs on 10-20 percent slopes at elevations ranging from 6,300-7,800 feet. It has moderately fine texture, derived from folded and faulted volcanic and sedimentary rocks that are comprised primarily of inter-bedded sandstone and shale.
- 84-2B occurs on 10-20 percent slopes at elevations ranging from 6400-7000 feet. It has moderately fine texture, derived from folded and faulted volcanic and sedimentary rocks that are comprised primarily of inter-bedded sandstone and shale.
- 87-1B occurs on 40 percent plus slopes at elevations ranging from 5,800-7,800 feet. It is a moderately erodible soil with moderately coarse texture. The parent material is limestone with some soft sedimentary rocks.
- 25-3A occurs on 0-20 percent slopes at elevations ranging from 8,500-9,500 feet. It is a moderately erodible soil, with medium texture, and is derived from volcanic rock.

### 3.2.3 EROSION HAZARD

Primary management considerations for the soils in the 2,574 Study Area include the potential for erosion on steep slopes and erosion related to the existing road network. In addition, the short growing season associated with these soils can affect the timing and success of revegetation plans and erosion control (USDA, Soil Conservation Service, 1992).

#### **Erosion from Mountain Slopes**

The Forest Service GIS database also includes information regarding the erosion hazard potential of the soils in the Study Area. The determination of the erosion hazard potential of surface soils assumes that all vegetative cover, including the surface organic horizons, is removed, and the soil is bare (USDA, 1995a). The erosion hazard potential also reflects the influences of climate, slope gradient, soil physical characteristics, and bedrock composition. The soils within the Study Area are presented by erosion hazard potential in Table 3.2-2 and the distribution of these areas is displayed graphically in Figure 3-1. Erosion hazard within the Study Area ranges from low at toe slopes and valley bottoms, to high on ridges and steep mid- and upper-mountain slopes. While most management activities in mountainous landscapes generate some increased risk of soil erosion, actual erosion depends on the degree of impact of a management action and the effectiveness of erosion control and site stabilization.





Bridger Bowl EIS

Figure 3-1

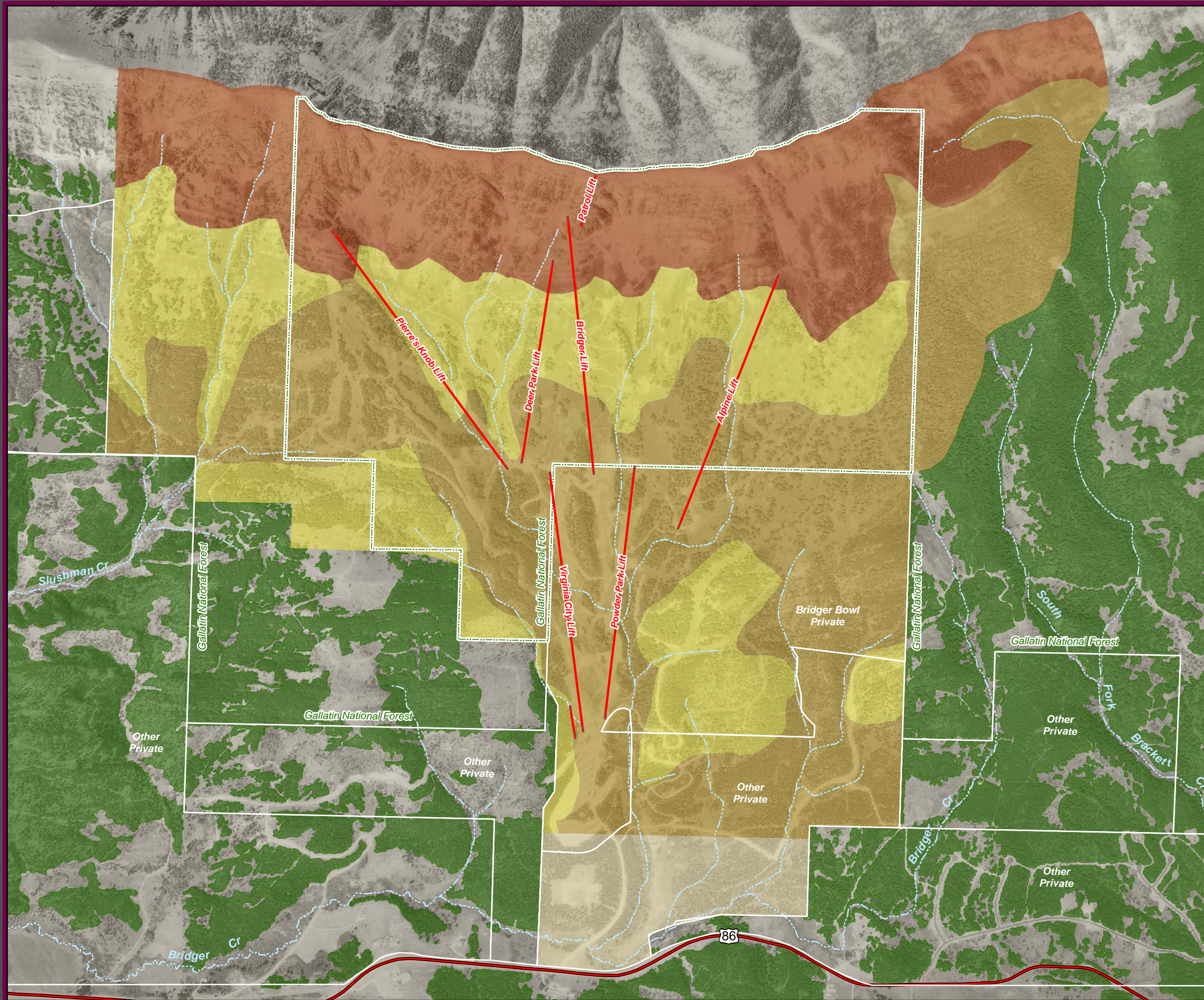
Existing Soil Erosion Potential

Legend

Soil Erosion Potential

- Low
- Moderate
- High
- Unclassified

- Existing Lift
- Existing Special Use Permit Boundary
- Additional Property Boundaries



0 700 1400 2800 feet

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**Table 3.2-2**  
**Existing Soil Types by Erosion Hazard within the Bridger Bowl Study Area**

<b>Erosion Hazard</b>	<b>Area (acres)</b>	<b>Percent of Total</b>
High	639.4	25
Medium	1,109.9	43
Low	686.8	27
Unclassified	137.9	5
<b>Total</b>	<b>2,574.1</b>	<b>100</b>

Actual surface erosion under natural conditions within the Study Area is common but not extensive. Observed natural surface erosion areas include: soils with minimal development of an organic horizon and sparse ground flora; secondary erosion of scarps and exposed banks in debris avalanche tracks and inner gorge slumps; and raindrop splash on sub alpine soils under herbaceous cover disturbed by freeze-thaw action. The latter is indicative of the sensitivity of soils in sub alpine areas to disturbance under management. Soil erosion from mountain slopes and roads is analyzed in more detail in Section 3.2.4.

### **Erosion from Roads**

Many different road characteristics determine the volume of sediment generated and delivered to streams. Some of these include: total length of road, road density, geology of the area, form and steepness of slopes, location, road type, surface material, number of stream crossings, type of drainage structures, and maintenance. These characteristics were incorporated into the R1R4 sediment model described below to determine the sediment yield derived from roads.

#### **3.2.4 SEDIMENT YIELD**

The R1R4 model (Cline et al., 1981) was used to estimate existing and potential sediment yields to waterbodies in the four major watersheds within and adjacent to the Bridger Bowl Study Area. The watersheds included in the Watershed Model Analysis Area are the South Fork of Brackett Creek (SF Brackett Creek), the Upper Bridger Creek, the Maynard Creek, and the Slushman Creek Watersheds. The Watershed Model Analysis Area includes the Bridger Bowl Study Area and the private and NFS lands downstream of the Bridger Bowl Study Area in the lower portions of the watersheds analyzed. The approximate size of the Watershed Model Analysis Area is 6,160 acres. Sediment yield coefficients have been modified to reflect conditions and actual measured sediment yields on the GNF. Sediment yields estimated by the model factor in the distribution of land types and associated basic erosion hazard rates in each soil type assuming average annual precipitation. Estimated natural sediment yield (sediment yield in absence of human activities) and existing sediment yields for each watershed are outlined in Table 3.2-3. The existing sediment yield reflects the impacts from existing development activities from the ski area and other private land owners and the Forest Service. The analysis results presented in Table 3.2-3 account for Best Management Practices (BMPs) that are currently used by Bridger Bowl for ski area maintenance activities to minimize erosion and sedimentation and to protect water quality.

**Table 3.2-3**  
**Existing Sediment Yield to watersheds within the Bridger Bowl Study Area**

<b>Watershed</b>	<b>Natural Sediment Yield (tons/year)</b>	<b>Existing Sediment Yield (tons/year)</b>	<b>Percent Above Natural Conditions</b>
SF Brackett Creek	83.0	89.8	8.2 %
Upper Bridger Creek	121.0	161.2	33.2 %
Maynard Creek	36.0	63.7	76.9 %
Slushman Creek	79.0	100.0	26.6 %

Source: Forest Service, 2004

The sediment yield to Upper Bridger Creek and Slushman Creek have been increased due to road building and timber harvest in the lower part of each drainage on NFS land and other privately owned land, these increases are 33 percent and 27 percent respectively. Maynard Creek, which flows through existing Bridger Bowl base area and adjacent private lands, has had a substantial increase (77 percent) in sediment yields due to historic building, road, and ski trail construction. The SF Brackett Creek watershed has the smallest increase (8 percent) in sediment yields as compared to the other three watersheds due to the limited amount of road building and development in the upper portion of the watershed.

### 3.2.5 SOIL PRODUCTIVITY

Forest Service policy identified in Forest Service Manual (FSM) 2550 for management on NFS lands requires the implementation of specific Soil Quality Standards (SQS) to ensure the maintenance of ecosystem processes and to avoid the permanent impairment of land productivity (USFS, 1998). Although these standards and guidelines do not apply to developed recreation sites, soil productivity within the Study Area is considered in this analysis because of the dispersed nature of ski area management and the concerns for watershed resource management in these areas. Activities such as soil grading and construction of impervious surfaces typically cause direct impacts to soil productivity, which reduces or eliminates the soil's capacity to support plant or animal life. Based on field investigations, aerial photo interpretation, and GIS analysis, the productivity of approximately 62.0 acres of soil has been permanently impacted by the historic construction of roads, parking lots, and buildings within the Study Area for the development of the ski area, residential homes, and other private land developments (see Table 3.2-4).

**Table 3.2-4**  
**Existing Impacts to Soil Resources within the Bridger Bowl Study Area**

<b>Parameter</b>	<b>Existing Conditions</b>
Permanent Impacts from Roads <sup>a</sup> (acres)	40.3
Permanent Impacts from Other Impervious Surfaces (acres)	21.7
<b>Total Permanent Soil Impacts (acres)</b>	<b>62.0</b>
<b>Percent of Study Area with Permanent Soil Impacts</b>	<b>2.4</b>

<sup>a</sup> The term "roads" includes all Forest Service, Bridger Bowl, and other private roads in the Study Area.

Graded areas that are revegetated are considered to have experienced temporary soil productivity impacts because the productivity of the soil would normally return over a short period of time (i.e., 5 to 10 years). Temporary impacts from previously graded areas that have been revegetated were not calculated in this analysis because identification of these areas from air photo interpretation was not possible. Ski trails and other cleared areas that consist of herbaceous and shrub vegetative cover have the potential for detrimental effects, especially on erosion prone soils. This is because they generally result in a reduced or absent duff layer common in adjacent forests, and they may result in the loss of organic matter from surface soil horizons. Most areas in a modified vegetative condition (e.g., ski trails) support good coverage of grasses, forbs, and shrubs, which create conditions that introduce organic matter to the soil and reduce soil erosion, thus retaining some level of soil productivity.

### **3.3 WATER RESOURCES**

Located approximately 15 miles northeast of Bozeman, Bridger Bowl is located in the Bridger Mountain Range. The Bridger Mountain Range is drained by the Shields River to the north, which flows into the Yellowstone River. The Bridger range is drained to the south by the Gallatin River, which flows into the Missouri River. The four sub-watersheds that occur within the 2,574 acre Bridger Bowl Study Area include SF Brackett Creek, Upper Bridger Creek, Maynard Creek, and Slushman Creek. Average annual precipitation varies from about 27 inches at the mouth of Maynard Creek to about 50 inches at the crest of the Bridger Range. According to information published by NOAA in 1973, rainfall intensity is mapped at lower elevations within the Study Area at 1.2 inches for a 2 year-6 hour event and 2 inches for a 25 year-6 hour event. Higher elevations have estimated rainfall intensity of 1.3 inches for a 2 year-6 hour event and 2.2 inches for a 25 year-6 hour event. Average annual snowfall varies from about 100 inches to 400 inches in the Study Area. Approximately 60 to 70 percent of the total annual precipitation occurs as snow.

#### **3.3.1 STREAMS**

The streams within the Bridger Bowl Study Area were identified by Forest Service GIS mapping and additional air photo interpretation. The stream network within the Bridger Bowl Study Area consists primarily of mainstem reaches and tributaries of Maynard Creek, the headwaters of Upper Bridger Creek northeast of Maynard Creek, and Slushman Creek at the southern portion of the Study Area (see Figure 3-2). Maynard Creek and Slushman Creeks are tributaries to Upper Bridger Creek, which flows south through Bridger Canyon to the confluence with the East Fork of the Gallatin River approximately one mile north of Bozeman. The headwaters of SF Brackett Creek is located near Bradley Meadows in the northwest portion of the Study Area. SF Brackett Creek flows north from the Study Area to the confluence with the Middle Fork and North Fork of Brackett Creek, before flowing into the Shields River approximately two miles north of the Study Area.

There are two water impoundments within the Study Area, one of these is located on Bridger Bowl private lands and is used for snowmaking operations. This impoundment is located just north of the base area between the parking lots and the Bridger Pines subdivision. The second impoundment is located just north of Bridger Pines on private land that is not owned by Bridger Bowl, Inc.





Bridger Bowl EIS

Figure 3-2

Existing Watershed Resources

Legend

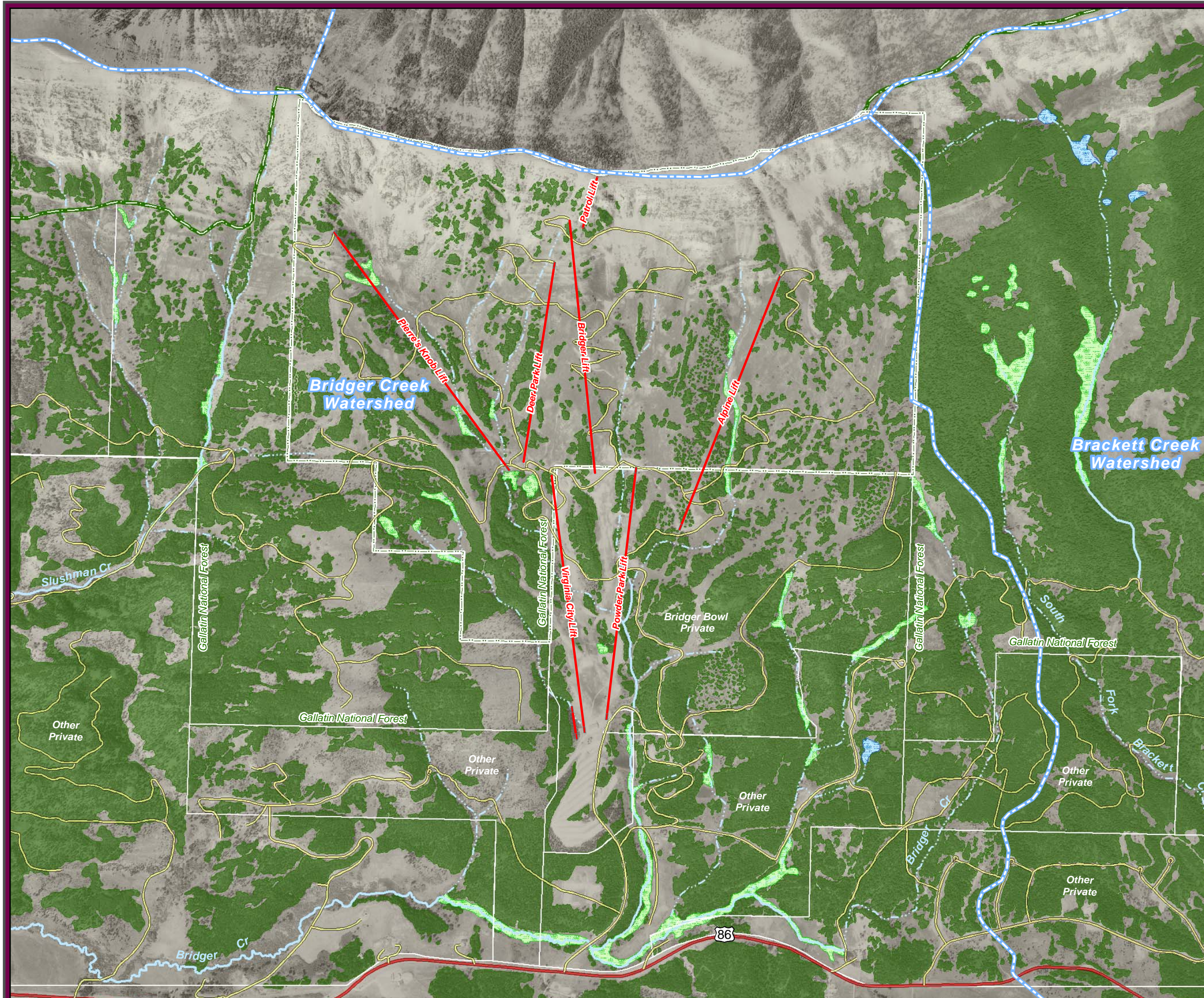
Stream Types

- Intermittent
- Perennial

Wetland Types

- Palustrine Emergent
- Palustrine Scrub Shrub

- Watershed Boundary
- Existing Lift
- Existing Road
- Special Use Permit Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries



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Information about roads, including road density and road crossings of streams, is important to make an assessment of watershed conditions. It can be used as a general measure of the watershed's overall condition and can also determine the potential risk of cumulative effects to the watershed. Table 3.3-1 shows that the Bridger Bowl Study Area contains 15.9 total miles of Forest Service, Bridger Bowl, and other private roads, which results in an overall road density of 4.0 mi/mi<sup>2</sup>. Of this road total, 8.6 miles of roads are on NFS lands. According to GIS analysis of the stream network in the Study Area, there are 29 road crossings of streams by Forest Service, Bridger Bowl, and other private roads. Approximately 17 of these stream crossings are for Forest Service roads and mountain service roads that are used or maintained by Bridger Bowl. The remaining stream crossings are from other Forest Service and Private Roads (e.g., Bridger Pines, Private logging roads, etc.). See Section 3.2.4 for more information regarding erosion from roads within Bridger Bowl Study Area.

**Table 3.3-1**  
**Bridger Bowl Study Area Stream Information**

Parameter	Study Area
Stream Length	
Perennial (miles)	2.5
Intermittent (miles)	11.2
<b>Total Stream Length</b>	<b>13.7</b>
Drainage Density (miles/miles <sup>2</sup> )	3.4
Total Road Length <sup>a</sup> (miles)	15.9
Roads on NFS lands (miles)	8.6
Road Density (miles/miles <sup>2</sup> )	4.0
Road Crossings of Streams	29

<sup>a</sup>Total roads include those on NFS lands, Bridger Bowl private lands, and other private lands.

The streams within the Study Area were surveyed for channel stability using methods established by Pfankuch (1975), where a higher score equals lower stability. Less than 38 is considered "excellent" stability, 39 to 76 is considered "good" stability, 77 to 114 is considered "fair" stability, and over 115 is considered "poor" stability. The streams draining the Bridger Bowl Study Area were also classified using geomorphic definitions as described in the Rosgen Stream Classification system (Rosgen, 1994).

SF Brackett Creek initiates with several seeps and springs into intermittent channels, finally becoming a perennial stream in the western portion of Section 18 in T1N; R7E. SF Brackett Creek at this location is an A3/A4 channel type which is characterized by a steep gradient (greater than 4 percent), cobble/gravel substrate, highly confined, with low sinuosity (less than 1.3). Channel stability in this reach is rated as 70 or "good." SF Brackett Creek changes to a B4 channel type near the Forest boundary and is characterized by a moderate gradient (1.5 to 4 percent), with gravel substrate, and moderate sinuosity (greater than 1.2). Channel stability in this reach is rated as 72 or "good."

Maynard Creek south of the Pierre's Knob lower terminal is a stable A2/A3 channel type, boulder/cobble dominated with a channel stability rating of 54 or "good." At the main road crossing of Maynard Creek near the base area, the stream reach is a A3 channel type but channel stability has been degraded to 97 or "fair" due primarily to accelerated sediment deposition from ski area developments (roads, ski trails, channel disturbances) and minor slumps. This lower reach of Maynard Creek shows some evidence of stream channel scour and bank cutting.

The portion of Slushman Creek within the Bridger Bowl Study Area is a very stable A2 channel type (steep boulder dominated channel) with a channel stability rating of 45 or "good."

The stream channel condition in Upper Bridger Creek was not analyzed for this EIS because it located primarily in private land and would not be significantly impacted by any of the proposed Action Alternatives.

### 3.3.2 WETLANDS

The wetlands within the Bridger Bowl Study Area were identified from field mapping done by Forest Service hydrologists and through air photo interpretation. Wetlands in the Study Area provide water quality protection via sediment filtration, habitat for aquatic and terrestrial life, flood storage, groundwater recharge and discharge, sources of primary production, recreation, and aesthetics. As shown in Table 3.3-2, there are 41 wetlands within the Bridger Bowl Study Area that collectively cover approximately 45.0 acres. Because most of the Study Area is well drained with limited areas of groundwater emergence, the wetlands found within the Study Area are primarily stream-fed palustrine scrub shrub and emergent wetlands that have unconsolidated bottom and rock bottom classes, as shown in Figure 3-2 (Cowardin, 1979).

Some small and localized seeps and spring wetlands occur at discharge points from unconsolidated Quaternary deposits that are described in the groundwater part of this section. These wetlands are small groundwater fed palustrine scrub shrub wetlands and are mainly found north of the parking lots and along Upper Bridger Creek. Below Bradley Meadows in SF Brackett Creek, springs, seeps, and a high water table produce localized areas of palustrine scrub shrub wetlands and palustrine emergent wetlands surrounded by alder thickets. The plant communities within the shrub scrub wetlands are typically dominated by mountain alder (*Alnus incana*), white spirea (*Spiraea berulifolia*), and Northern black current (*Ribes* spp.). The emergent wetlands found in the northwest portion of the Study Area have plant communities dominated by Western coneflower (*Rudbeckia occidentalis*), valerian (*Valeriana dioica*), larkspur (*Delphinium* spp.), and arrowleaf balsamroot (*Balsamorhiza sagittata*). False hellebores (*Veratrum* spp.) are often found in more moist portions of these wetlands, which are typically adjacent to streams.

**Table 3.3-2  
Summary of Existing Wetlands in the Bridger Bowl Study Area**

Wetland Type	Number of Wetlands	Total Area (acres)
Palustrine Emergent	3	3.2
Palustrine Scrub Shrub	38	41.8
<b>Total</b>	<b>41</b>	<b>45.0</b>

### 3.3.3 WATER QUANTITY

#### Surface Water

Average annual water yield rates range from 0.71 acre-feet of water per acre of land area at approximately 6,000 feet elevation to 2.2 acre-feet of water per acre of land area at approximately 8,700 feet elevation within the Study Area. Average annual water yield by the entire drainages is estimated in Table 3.3-3. Annual hydrographs are sharply influenced by snowmelt with most of the runoff occurring as snowmelt during May and June with low flows occurring in February (Williams, 1967).

**Table 3.3-3**  
**Projected Annual Water Yield for the Watershed Model Analysis Area**

Parameter	SF Brackett	Upper Bridger	Maynard	Slushman
Watershed Area (mi <sup>2</sup> )	2.4	2.3	2.2	2.7
Existing Water Yield (acre ft./yr)	1,410	1,329	1,295	1,590
Percent Above Natural	0.07	0.3	0.7	0.6

Annual water yield in Maynard Creek, Upper Bridger Creek, and Slushman Creek are elevated above natural levels because the existing watershed developments (e.g., roads, parking lots, ski trails) are more efficient at conveying overland flow to the stream system than under natural conditions. Existing watershed development by Bridger Bowl, the Forest Service, and other private developments such as roads, clearcuts, ski trails, buildings, and parking lots reduce transpiration by vegetation and infiltration into the soil. Developments in these watersheds have increased current water yield to an estimated 0.7 percent in Maynard Creek, 0.6 percent increase in Slushman Creek, and 0.3 percent in Upper Bridger Creek. Peak snowmelt runoff discharge in Maynard Creek is likely greater than the model predicts since the existing watershed developments are more efficient at conveying overland flow to the stream system. The limited amount of development in SF Brackett Creek is reflected in the model where the annual water yield is only 0.07 percent above natural conditions.

The water source for snowmaking at Bridger Bowl is the impoundment in the base area. Approximately 27 acres of ski trails currently have snowmaking coverage that is provided by this impoundment. The maximum water volume withdrawn from Maynard Creek for snowmaking in any one year is an additional 20 acre-feet above the 2,240 acre-feet of water yield (annual average). The water volume used for snowmaking was based on the size of the detention pond, since the size of the pond did not change when the snowmaking area was expanded in 2003, the water volume modeled for snowmaking would remain unchanged. Assuming that 80 percent of the Maynard Creek water yield occurs as snowmelt runoff, and that none of the snowmaking water would evaporate, the water yield increase of Maynard Creek would be 0.9 percent, which is too low to be measurably affected by streamflow, channel scour, or sediment yield.

## Groundwater

Whittingham (1996) reports that two types of aquifers occur in the Maynard Creek drainage including fractured bedrock and unconsolidated Quaternary deposits including rock glacial till, undifferentiated till, outwash, and buried channels. Bedrock fractures are limited and bedrock aquifers yield only a minor portion of groundwater discharge to Maynard Creek. The surficial Quaternary deposits are the primary discharging aquifers in Maynard Creek, mainly at lower slope locations. Groundwater discharge is limited, however, and most of the Maynard Creek drainage discharge results from direct surface water runoff. The Whittingham study focused on the Maynard Creek system, but it is assumed that groundwater characteristics in Slushman, Upper Bridger, and SF Brackett Creeks are very similar due to the similarities in geology, topography, and geomorphology between all four of these watersheds.

At Bridger Bowl, groundwater is utilized for potable water use. The base area facilities, including the Jim Bridger Lodge, the ski patrol building, and the new Day lodge utilize one well. The water supply system consists of a well and pump, chlorination system, and a 3,400-gallon holding tank. Water consumption at Bridger Bowl is approximately three gallons per person per day. The well produces at 34 gallons per minute (gpm) and is capable of supplying up to 22,440 gallons per day following standard hours of operation, which can accommodate approximately 6,400 people per day. The Deer Park Chalet has its own well with a sustained yield of 20 gpm. The water supply system for the Deer Park Chalet also has a 3,900 gallon storage tank and two pressure tanks. All nearby residential developments have their own wells and wastewater treatment systems.

### 3.3.4 WATER QUALITY

All of the streams in the Study Area have been designated by the Montana Department of Environmental Quality (MDEQ) as B-1 Classification (MDEQ, 1994). The B-1 Classification is designed to protect a variety of beneficial uses including drinking (after treatment), recreation, growth and propagation of salmonid fisheries, and agricultural and industrial water supply.

None of the streams in the Study Area are classified as water quality limited segments by the MDEQ 2002 303(d) list or listed as segments in need of total maximum daily load (TMDL) development by the MDEQ (MDEQ, [www.deq.state.mt.us/wqinfo/303\\_d/303d\\_information.asp](http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp), March 24, 2004). Maynard and Slushman Creeks are tributaries to Upper Bridger Creek, which has beneficial water uses such as irrigation purposes and downstream fisheries. Upper Bridger Creek is tributary to the East Fork of the Gallatin River, which is also not listed as a water quality limited segment (MDEQ, [www.deq.state.mt.us/wqinfo/303\\_d/303d\\_information.asp](http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp), March 24, 2004). The water quality of the East Fork of the Gallatin River has not been assessed for beneficial uses such as agriculture, aquatic life support, cold water fisheries (trout), drinking water supply, industrial uses, or primary recreational contact. The East Fork of the Gallatin River, including Bridger Creek and tributaries must be re-assessed by MDEQ by 2007 for water quality impairment. The actual assessment will likely occur in 2005 and at that time it is possible that the East Fork of the Gallatin River may be added to the 303(d) list of impaired waterways (Story, 2003). The SF Brackett Creek is a tributary to the Shields River, which is on the 303(d) list of impaired waterways ([www.deq.state.mt.us/wqinfo/303\\_d/303d\\_information.asp](http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp) on March 24, 2004). The Shields River is listed for partial impacts to aquatic life and cold water

fisheries due to erosion, dewatering problems, flow alterations, and riparian degradation from mainly agricultural sources.

Sediment guidelines have been developed by the GNF based on fisheries being the primary beneficial use of forest streams. The R1R4 model (Cline, 1981) was used to estimate existing and potential sediment yields of the watersheds within the Watershed Model Analysis Area. This analysis is discussed in Section 3.2.4 – Sediment Yield. Estimated baseline (natural) sediment yield to waterbodies and existing sediment yields for each watershed are shown in Table 3.2-3.

SF Brackett Creek is classified as a Class A stream in the GNF due to the presence of Yellowstone Cutthroat Trout in the lower reaches of its drainage. According to GNF guidelines, to protect Class A streams, sediment increases should not exceed 30 percent above natural rates. The estimated annual sediment yields in SF Brackett Creek under existing conditions is 89.8 tons per year (see Table 3.2-3), which is 8.2 percent above natural conditions (Story, 2003). Therefore, the existing water quality of SF Brackett Creek is within GNF standards for Class A streams.

Maynard, Upper Bridger, and Slushman Creeks are considered Class D streams in the GNF since there is no documented presence of fish in these drainages. The main emphasis in Class D streams is to maintain geomorphic integrity without excessive downstream sediment discharge. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates (Story, 2003). The sediment yield to Upper Bridger Creek and Slushman Creek have been increased above natural rates (33 – 27 percent) due to road building and timber harvest in the lower part of each drainage on NFS land and other privately owned land. Maynard Creek, which flows entirely through existing Bridger Bowl base area, has had a substantial increase (77 percent) in sediment yields above natural rates due to historic building, road, and ski trail construction. The sediment yield in Maynard Creek is expected to decrease over time as historic base area disturbances continue to recover hydrologically. The estimated sediment yields to these three streams for existing conditions do not exceed the GNF standard of “100 percent above natural conditions” for Class D streams (Story, 2003).

The Forest Service approved the use of herbicide at Bridger Bowl to control areas infested with noxious weeds. Herbicide is not used for ski area wide vegetation management and the manufacturers instructions are followed to ensure adequate usage and distances from waterbodies. In addition, Bridger Bowl currently uses a chemical called Snowmax™, which is mixed with water to improve snowmaking operations. Snowmax™ raises the freezing temperature of the water and works as a “ice-nucleating seed” that ice crystals can attach to. Snowmax™ is EPA approved and there have been many studies indicating that Snowmax™ has minimal effects to humans, animals, or the water quality of groundwater or streams (Colorado State, 1998). The potential of oil and grease pollution from stormwater runoff from the parking lots is minimized through appropriate erosion control BMPs. No water quality data for oil and grease presence in streams within the Study Area was available for this analysis.

The Deer Park Chalet has its own re-circulating sand filter treatment system, which was built in 1996 to accommodate approximately half of anticipated visitation at the time. In August 2001, Bridger Bowl received permission from the MDEQ to construct a re-circulating sand filter

wastewater treatment system with a capacity to serve approximately 5,400 skiers per day. Both wastewater treatment systems were given a “nondegradation determination” by the MDEQ by showing that they met Montana’s nondegradation policy and rules (75-5-303, MCA and ARM 16.20.701). The wastewater treatment systems are septic systems that re-circulate effluent through sand filters, and then discharge effluent to the ground via a pressure closed subsurface drainfield. This wastewater treatment system could be expanded in the future to meet a larger skier capacity.

The water use as measured by Bridger Bowl from 1983 to 1999 averages approximately 3.5 gallons per skier visit. In 2002, waterless urinals were installed in the Jim Bridger Lodge as a water conservation measure. As a result, water use, as measured at the base area treatment system for the 2002/03 season, water use has been reduced to three gallons per skier visit. Recent water sampling (conducted in May 2002) resulted in measured Nitrate/Nitrite levels of 0.71 mg/L (Montana Microbiological Services, June 2002). The Federal water quality standards for nitrate and nitrite are 10 and 1 mg/L, respectively (EPA, 1986). This system also has a 3,900-gallon storage reservoir and two pressure tanks to service the facility. This well was also tested for nitrate and nitrite in 2002; analysis showed in measured Nitrate/Nitrite levels of 0.71 mg/L (Montana Microbiological Services, June 2002).



### 3.4 VEGETATION

A vegetation analysis was conducted within the 2,574 acre Bridger Bowl Study Area. As described in the introduction to this chapter, the Study Area including the existing SUP area, the proposed SUP expansion areas, and private lands within and adjacent to the ski area. A number of distinct plant community types are present in the Study Area ranging in elevation from 6,200 feet to 8,500 feet. The current distribution of plant community types within the Study Area reflects the elevation and moisture gradient variance within the Bridger Mountains, as well as the cumulative effect of land-use activities and natural disturbances. There are seven plant community types within the Study Area including spruce/sub alpine fir, Douglas-fir, lodgepole pine, mixed conifer, quaking aspen, shrubs, and herbaceous (see Table 3.4-1). Non-vegetated land cover types comprise the remaining portions of the Study Area and they include, open water, rock and talus, and developed cover. Developed cover is defined for this analysis as all impervious surfaces (e.g., roads, parking lots, and buildings). Plant community cover types were delineated based on aerial photograph interpretation, GIS analysis, land surveys, and site visits. The total approximate area of each cover type within the Study Area is shown in Table 3.4-1.

**Table 3.4-1  
Existing Plant Community within the Bridger Bowl Study Area**

<b>Plant Community Type</b>	<b>Area (acres)</b>
<b><i>Old growth</i></b>	
Douglas Fir	22.0
Lodgepole pine	50.3
Spruce/sub alpine Fir	110.6
<b>Total Old growth</b>	<b>182.9</b>
<b><i>Mature</i></b>	
Douglas Fir	290.4
Lodgepole pine	27.7
Spruce/sub alpine Fir	116.7
Mixed conifer	168.2
<b>Total Mature</b>	<b>603.0</b>
<b><i>Immature</i></b>	
Douglas Fir	23.3
Lodgepole pine	77.7
Spruce/sub alpine Fir	39.1
Mixed conifer	29.2
Quaking Aspen	15.3
<b>Total Immature</b>	<b>184.6</b>
<b>Total Forest Cover</b>	<b>970.5</b>
<b><i>Non-forest cover</i></b>	
Shrub	20.8
Herbaceous	1,072.5
Rock and Talus	449.4
<b>Total Non-forest</b>	<b>1,542.7</b>
<b>Total Vegetation Cover</b>	<b>2,513.2<sup>a</sup></b>

<sup>a</sup>Total vegetation cover does not equal the Study Area size of 2,574 because there are approximately 63.6 acres of open water and developed land that are not vegetated in this area.





Bridger Bowl EIS

Figure 3-3

Existing Vegetation Communities

Legend

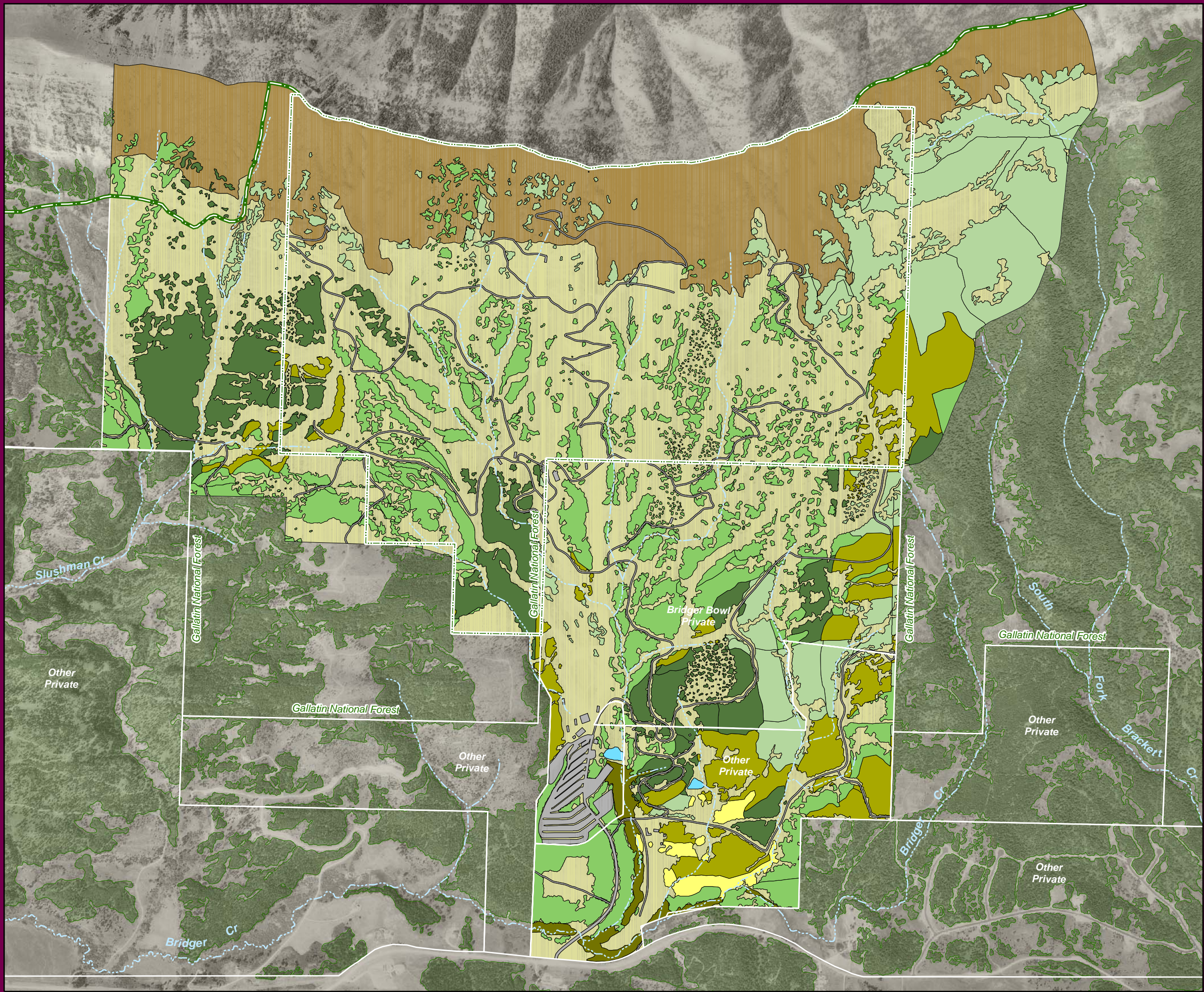
Landcover Types

- Developed
- Rock
- Open Water

Vegetation Communities

- Quaking Aspen
- Spruce / Sub Alpine Fir
- Douglas Fir
- Lodge Pole
- Mixed Conifer
- Herbaceous
- Shrub

- Existing Special Use Permit Boundary
- Forest Service Roadless Boundary
- Additional Property Boundaries



0 700 1400 2800 feet

Date: 3.15.04  
Created By: GH  
Produced By:

SE GROUP





### 3.4.1

### PLANT COMMUNITY TYPES

The spruce (*Picea Spp.*) and sub alpine fir (*Abies lasiocarpa*) plant community type is a moist, sheltered upland community (USDA, GTR-INT-34, 1977), most common on north and northeast slopes between 6,200 and 8,500 feet elevation within the Study Area. Three distinct age classes of spruce/sub alpine fir vegetation cover types have been identified; old growth, mature, and immature. Engelmann Spruce, lodgepole pine (*Pinus contorta*), and limber pine (*Pinus flexilis*) occur as a codominant component with spruce/sub alpine fir in the closed canopy overstory. The understory is a mix of shrubs and perennial herbs composed of grouse whortleberry (*Vaccinium scoparium*), blue huckleberry (*Vaccinium globulare*), Western meadowrue (*Thalictrum occidentale*), elk sedge (*Carex geyeri*), and scattered virgin's bower (*Clematis pseudoalpina*). Typically found on steep slopes, these shrub and herbaceous vegetation communities vary within the three spruce/sub alpine fir age classes.

The Douglas fir (*Pseudotsuga menziesii*) plant community type is found within the current permit area on southeast and eastern aspects at mid-low elevations. On the eastern aspect slopes, the Douglas fir plant community type was limited to a small area that is moisture limited and dominated by grass in the understory. As with the spruce/sub alpine fir plant community type, three age classes of Douglas fir were identified; old growth, mature, and immature. Scattered lodgepole, limber pine, and spruce/sub alpine fir were found within the canopy and subcanopy of this plant community. The shrub community composition is similar to the spruce/sub alpine fir shrub community but included snowberry (*Symphoricarpos albus*) and pinegrass (*Calamagrostis rubescens*). The herbaceous vegetation is generally sparse under the closed canopy stands dominated by Douglas fir.

The lodgepole pine (*Pinus contorta*) plant community type is less common throughout the Study Area. Three distinct age classes of lodgepole pine vegetation cover types have been identified; oldgrowth, mature, and immature. These pine dominated plant communities contain scattered spruce/sub alpine fir, englemann spruce, and Douglas fir. The understory is a mix of shrubs and perennial herbs composed of grouse whortleberry, blue huckleberry, Western meadowrue, and elk sedge.

The mixed conifer plant community type is scattered throughout the Study Area at varying elevations and is made up of mature and immature stands. These forest communities are composed of lodgepole pine, Douglas fir and spruce/sub alpine fir. The understory is primarily mixed shrubs of snowberry, grouse whortleberry, and a thin herbaceous layer of pinegrass.

The quaking aspen (*Populus tremuloides*) plant community type occupies lower elevations and occurs along mountain streams. This mature plant community type occurs primarily at the base of the Bridger Mountains near deep and moist soils. The subcanopy and shrub layer is mixed with western serviceberry (*Amelanchier alnifolia*), mountain snowberry (*Symphoricarpos oreophilus*) and a number of *Ribes* species are associated with the quaking aspen plant community type.

The shrub plant community type occurs in isolated patches near seeps and moist soils. These plant communities are dominated by mountain alder (*Alnus incana*), white spirea (*Spiraea berulifolia*), snowberry, and *Ribes* species.

The herbaceous plant community type occurs at the mid-elevation portions of the Study Area where there is no evidence of trees at any life stage. The herbaceous areas are dominated by forbs including a mix of Western coneflower (*Rudbeckia occidentalis*), valerian (*Valeriana dioica*), sticky geranium (*Geranium viscosissimum*), larkspur (*Delphinium spp.*), and arrowleaf balsamroot (*Balsamhoriza sagittata*). In moist portions of these meadows (often adjacent to streams), false hellebores (*Veratrum spp.*) often dominate.

The rock and talus cover type is characterized by unstable soils and rock with krumholtz (stunted) spruce/sub alpine fir, scattered white bark pine, and limber pine. Engelmann spruce is less common, but it is present in the scattered clumps of krumholtz trees. The shrub and herbaceous component is sparse with low growing common juniper (*Juniperus communis*), forbs, and grasses. This habitat type is the result of harsh climactic conditions, rock slides, and a very short growing season.

The 1.6 acres open water cover type is characterized as water impoundments, reservoirs, or natural lakes. Since this cover type is not a vegetation community, it is not included in Table 3.4-1.

The 62.0 acres developed cover type includes all paved, graveled, and dirt roads, including parking lots, and structures. Since this cover type is not a vegetation community, it is not included in Table 3.4-1.

### 3.4.2 THREATENED AND ENDANGERED PLANT SPECIES

One federally listed species, Ute Ladies' Tresses (*Spiranthes diluvialis*), and one proposed for listing species, Oregon Checker-mallow (*Sidalsea oregana*), are known or suspected to occur in the Bridger Mountains, Gallatin County, and on the GNF. The two species are listed by the USDI-Fish and Wildlife Service (USFWS) and the Montana Natural Heritage Program (NHP). The following table and discussion addresses the federally listed species including their status, habitat requirements, and possible occurrence in the Bridger Bowl Study Area.

**Table 3.4-2**  
**USFWS Threatened and Endangered Plant Species for Gallatin County**

Species	Elevation (ft)	Habitat	Status
Ute Ladies' Tresses ( <i>Spiranthes diluvialis</i> )	4,050-5,080	wetlands/open valleys	Threatened
Oregon Checker-mallow ( <i>Sidalsea oregana</i> )	3,026-6,840	valley grasslands	Proposed Listing

Source: USFWS, Montana NHP

#### **Ute Ladies' Tresses (*Spiranthes diluvialis*)**

Ute Ladies' Tresses is a perennial orchid usually with one stem that is 8-20 inches tall and arising from tuberously thickened roots. Its narrow leaves are 0.5 inch wide, can reach 11 inches long, are longest at their base, and persist during flowering. The inflorescence consists of few to many white or ivory flowers clustered in a spike of 3-rank spirals at the top of the stem. The

sepals and petals are ascending or perpendicular to the stem. Ute Ladies' Tresses flowers in August-early September.

### **Oregon Checker-mallow (*Sidalsea oregana*)**

Oregon Checker-mallow is an herbaceous perennial with erect stems that are one to six inches tall and arise from a branched rootcrown that surmounts a taproot. The basal leaves have long petioles and round blades that are deeply palmately divided into five to nine nearly linear lobes. The alternate stem leaves become smaller with few lobes upward. The lower stems and leaves are sparsely covered with star-shaped hairs. Short-stalked flowers are borne in a terminal spike. Each pink flower has a 5-lobed, hairy calyx that is four to nine mm long and five separate, oblong, shallowly bilobed petals that are 15-20 mm long. The fruit, which is two to three mm long, is a flattened-globose capsule with many sections, giving it the appearance of a peeled orange. Oregon Checker-mallow flowers in the end of June-mid-August and fruits in late August.

On August 30, 1997 a sensitive plant survey was conducted in the Bridger Bowl Study Area (McCarthy, 1997). Although suitable habitat for Oregon Checker-mallow was present, no federally listed or proposed for listing plant species were observed or recorded in the survey report. As described in the mitigation table, pre-project surveys will be conducted for these species prior to any project implementation.

### **3.4.3 SENSITIVE PLANT SPECIES**

Currently twenty sensitive plant species are reported, or suspected to occur in the Bridger Mountains, Gallatin County, or on the GNF. These species habitat ranges from wet to dry and from low elevation to above tree line. The following table and discussion addresses the seventeen sensitive plant species which were listed prior to the 1997 sensitive plant survey, and the three sensitive plant species listed thereafter. All species, their habitat, and their elevation occurrence are listed in Table 3.4-3.

**Table 3.4-3**  
**Sensitive Plant Species with Potential for Occurrence in the Bridger Mountains**

Species	Surveyed	Elevation (ft)	Habitat
Musk-root ( <i>Adoxa moschatellina</i> )	Yes	4,000-6,000	cool moist/rock slides
Short-styled columbine ( <i>Aquilegia brevistyla</i> )	Yes	5,000-6,200	open woods/stream banks
Large-leafed Balsamorhiza ( <i>Balsamorhiza macrophylla</i> )	Yes	7,400-7,920	sagebrush/grassland
Pale Sedge ( <i>Carex livida</i> )	Yes	2,910-6,030	wet organic soils/fens
Slender Indian Paintbrush ( <i>Castilleja gracillima</i> )	Yes	5,160-7,000	wet meadows
Small Yellow Lady's-slipper ( <i>Cypripedium parviflorum</i> )	Yes	2,520-6,200	damp mossy woods/fens
*English sundew ( <i>Drosera anglica</i> )	No	3,100-9,000	wet organic soils/fens
*Beaked spikerush ( <i>Eleocharis rostellata</i> )	No	2,700-6,100	alkaline wet soils/fens
Giant helleborine ( <i>Epipactis gigantea</i> )	Yes	2,900-6,200	Stream banks/fens/seeps
*Slender cottongrass ( <i>Eriophorum gracile</i> )	No	3,080-7,600	wet organic soils/fens
Hiker's gentian ( <i>Gentianopsis simplex</i> )	Yes	4,460-8,400	fens/meadows/seeps
Northern rattlesnake plantain ( <i>Goodyera repens</i> )	Yes	4,400-6,800	north facing/mossy slope
Discoïd goldenweed ( <i>Haplopappus macrocarpa</i> , <i>macrocarpa</i> )	Yes	6,840-8,900	rock slides/krummholz
Austin's knotweed ( <i>Polygonum Douglasii</i> var. <i>austinae</i> )	Yes	4,320-8,520	open gravelly shale
Jove's Buttercup ( <i>Ranunculus jovis</i> )	Yes	6,700-9,500	sagebrush/grassland
Barratt's willow ( <i>Salix barrattiana</i> )	Yes	6,240-10,000	cold moist soil
Wolf's willow ( <i>Salix wolfii</i> var. <i>wolfii</i> )	Yes	7,500-10,000	cold moist soil
Shoshonea ( <i>Shoshonea pulvinata</i> )	No	6,440-7,800	limestone outcrops
Small-flowered pennycress ( <i>Thlaspi parviflorum</i> )	No	6,500-1,000	grasslands/alpine turf
Alpine meadowrue ( <i>Thalictrum alpinum</i> )	Yes	4,855-8,280	moist alkaline meadows
California false-hellebore ( <i>Veratrum californicum</i> )	Yes	6,160-7,360	wet meadows/stream banks

\*Indicates 1999 listing

Source: Forest Service, USFWS, & Montana NHP

On August 30, 1997 a sensitive plant survey was conducted in the Bridger Bowl Study Area. Although suitable habitat for many of the species was present, none of the sensitive plant species were observed within the Bridger Bowl Study Area during the survey (McCarthy, 1997). Two species, Shoshonea and Small-flowered pennycress, were not surveyed for during the 1997 survey.

In 1999 three new sensitive plant species were listed in Bridger Mountain Range, Gallatin County, or the GNF area. These species are denoted by an asterisk (\*) in the above table. All three species are unique to wet organic soils and fens occurring at elevations found within the Study Area. However, no bogs or fens were identified during the wetland survey, so these species are not likely to be present in the Study Area.



The whitebark pine (*Pinus albiculis*) and Timothy (*Phleum pratense*) have not been identified as a Species of Concern or federally listed species by the USFWS, Forest Service, or the MNHP. Therefore, they were not included in the Sensitive Plant Species analysis.

#### 3.4.4 FRAGMENTATION AND OLD GROWTH

The Bridger Mountains are an isolated range separated from contiguous mountain habitat by surrounding agricultural and rural land. The composition and distribution of vegetation communities in the Bridger Mountains has been influenced over time by human activities such as timber harvest, domestic livestock grazing, fire suppression, developed and dispersed recreation, development and use of transportation systems, and residential development. As part of the Forest planning process, the Forest Service is conducting systematic landscape-scale analyses by geographic area; typically at the scale of a mountain range. Such an analysis at the landscape scale has yet to be completed for the Bridger Mountain Range.

An analysis of the east side of the Bridger Range and many surrounding reference compartments and mountain ranges was performed to analyze potential changes in fragmentation and old growth as a result of the Proposed Action (Novak, 2003). The analysis area for the fragmentation study included Timber Compartments 504 and 515, which encompasses approximately 18,294 acres of land on the GNF. The study used the FRAGSTATS model, which is a spatial pattern analysis program for quantifying landscape structure (McGarigal and Marks, 1995), and assumed that 80 acres of contiguous mature forest is a minimum required for many interior forest animal species (Harger, 1978) and fragmented forest is the result of human and natural disturbances. Based on this study, the following conclusions were reached based on current conditions: 1) the Fragmentation Analysis Area (FAA) of compartment 504 has the lowest percent of interior forest habitat of any of the four areas analyzed; 2) the largest forest patch identified in the FAA was smaller than all of the other large patches identified in the four reference areas; and 3) the FAA has an intermediate number of interior forest patches (Novak, 2003). Based on the above information, it is reasonable to conclude that presently the FAA is one of the most fragmented forested areas on the Gallatin National Forest (GNF) (Novak, 2003). This is due to past activities from timber harvest, road building, and residential development throughout the compartments and conditions common to high elevation ridge soils.

Observations within the smaller scale, 2,574 acre Bridger Bowl Study Area follow similar trends to those observed in the FAA. Forest clearing for ski trails and other private developments such as residential homes and private timber harvest has fragmented native forest communities and possibly influenced changes in biodiversity. While much of the forest communities in the upper elevations (above 7,500 feet) of the Study Area are naturally sparse and patchy due to the harsh environment, forest clearing in the lower elevation portions of the Study Area has resulted in the permanent modification of forested habitat. Approximately 426.4 acres of the Study Area has been modified for ski runs and associated roads, buildings, and parking lots. A large proportion of the existing SUP area below 7,500 feet is in what is considered a fragmented state due to the forest clearing and development by Bridger Bowl and other private parties. The lower elevation portions of the north and south expansion areas are currently undisturbed and are not fragmented, while the portions of the expansion areas above 7,500 feet are naturally fragmented.

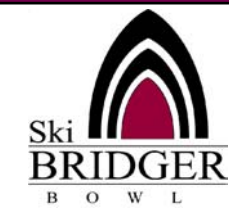
According to the GNF Plan, the Forest will strive to maintain at least 10 percent of the forest land within a timber compartment as old growth forest. The Bridger Bowl Study Area includes small portions of timber compartments 504 and 515 (see Figure 3-4). Therefore, timber compartments 504 and 515 were studied using GIS software to determine the current extent of old growth forest within each compartment. The forest compartments analyzed total approximately 18,336 acres and extend well outside the 2,574 acre Study Area. Representative compartments in the Gallatin Range and Crazy Mountain Range were used as a reference and control for fragmentation comparison. Currently, the east side of the Bridger Range is one of the most fragmented forest areas in the GNF (Novak, 2003). As displayed in Table 3.4-4, there is approximately 413 acres of old growth forest within the 5,897 acres of forest land within in compartment 504. The percent of old growth forest as compared to the forest land in compartment 504 is approximately 7.0 percent, which is below the Forest Plan Standard of 10 percent (USDA, 1987). Compartment 515 contains approximately 1,051 acres of old growth forest, which is approximately 11.6 percent of the forested area of the compartment and therefore, compartment 515 is above the standard of 10 percent.

**Table 3.4-4**  
**Existing Old Growth Forest in Timber Compartments 504 and 515**

<b>Parameter</b>	<b>Acres</b>	<b>Percent</b>
Old Growth Forest in Compartment 504	413	7.00
Old Growth Forest in Compartment 515	1,051	11.60

Source: Forest Service





Bridger Bowl EIS

Figure 3-4

Existing Forest Age Classes

Legend

Forest Age Classes

Immature

Mature

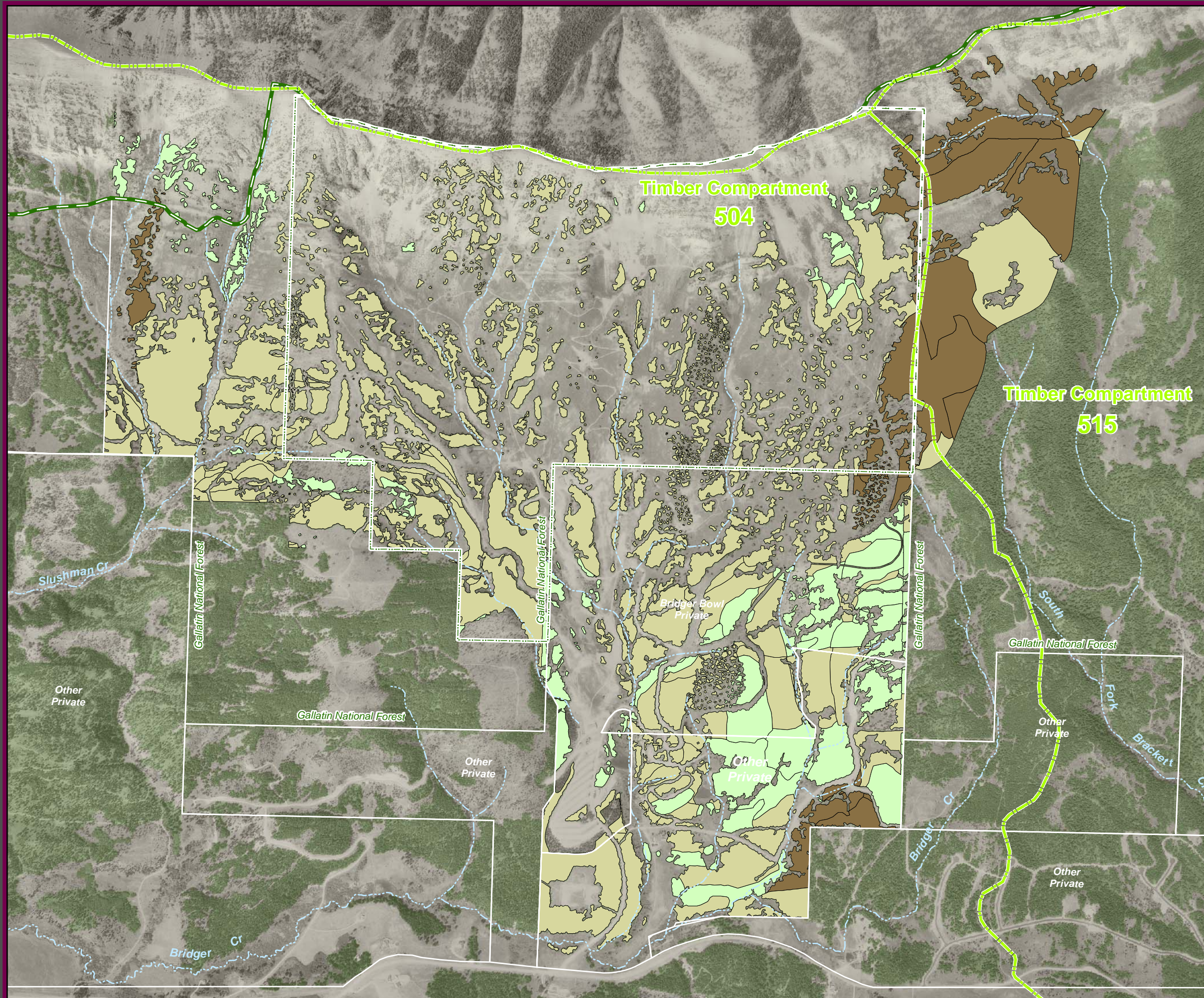
Old Growth

Timber Compartment Boundaries

Existing Special Use Permit Boundary

Forest Service Roadless Boundary

Additional Property Boundaries



0 700 1400 2800 feet

Date: 3.15.04  
Created By: GH  
Produced By:

SE GROUP





## 3.5 WILDLIFE

### 3.5.1 INTRODUCTION

The Forest Plan has two specific goals that are directly related to wildlife:

- Provide habitat for viable populations of all indigenous wildlife species and for increasing populations of big game animals.
- Provide sufficient habitat for recovered populations of threatened and endangered species (i.e., grizzly bear, bald eagle, Canada lynx, and gray wolf).

Other GNF wildlife objectives include:

#### *Wildlife*

Management of wildlife habitat would emphasize forage and cover needs on big game winter range. Vegetative manipulation projects may include prescribed burns or timber harvest. Non-game and small game needs would be enhanced by providing for vegetative diversity and protecting special habitat components. The Forest would apply grizzly bear guidelines developed from the Interagency Grizzly Bear Guidelines of 1986 and the “Grizzly Bear Recovery Plan” of 1982, which are included in the current Forest Plan. Management of the Forest would provide for the recovery of the bald eagle and peregrine falcon.

#### *Sensitive and Indicator Species*

Habitat that is essential for species identified in the Sensitive Species list developed for the northern region would be managed to maintain these species. These species include trumpeter swan, flammulated owl, wolverine, western big-eared bat, harlequin duck, northern goshawk, peregrine falcon, boreal toad, northern leopard frog, and black-backed woodpecker. Indicator species, which have been identified as species groups, whose habitat is most likely to be affected by Forest management activities, would be monitored to determine population change. These species include grizzly bear, bald eagle, elk, pine marten, and northern goshawk.

#### *Biodiversity*

Biodiversity (or biological diversity) is a term defined by the Office of Technology and Assessment as “the variety and variability among living organisms and the ecological complexes in which they occur” (Hann, 1990). Multiple laws mandate agency attention to the concept of biodiversity. The National Forest Management Act (NFMA 1976) 36 CFR 219.26 states that “Forest planning shall provide for diversity of plant and animal communities... consistent with the overall multiple-use objectives of the planning area.” The Endangered Species Act (ESA 1973) requires the conservation of threatened and endangered species so as to maintain biodiversity. The National Environmental Policy Act (NEPA 1976) Title I, Sec. 101 (b) (4) relates the need to “maintain, wherever possible, an environment which supports diversity”. Biodiversity is a complex concept that covers a broad spectrum of spatial and temporal scales. At the fine end of the spatial scale, biodiversity can be assessed at the molecular and genetic



level while at the other end of the scale biodiversity may be considered at the landscape or even global level.

Biodiversity may be influenced over time by natural ecological processes as well as human land use activities. Natural ecological processes, as well as human land manipulation, can have varying consequences to local wildlife populations. Some habitat changes are temporary, such as those produced by fire, wind, insects, and disease, while others are permanent, such as some changes caused by human development. Temporary habitat changes may impact biodiversity in the affected area, but such effects are typically short-lived and do not likely influence biodiversity at the larger scale. Cumulative impacts of temporary habitat changes are more likely to have significant impacts on biodiversity at the landscape level. Permanent habitat alterations are more likely to impact faunal diversity, both at the local scale with individual events, as well as cumulatively over space and time.

The Bridger Mountains are an isolated range separated from contiguous mountain habitat by surrounding agricultural and rural land. Vegetative structure and faunal occupation of the Bridger Mountains has been influenced over time by human activities such as timber harvest, domestic livestock grazing, fire suppression, developed and dispersed recreation, development and use of transportation systems, and residential development. As part of the Forest planning process, the Forest Service is conducting systematic landscape-scale analyses by geographic area; typically a mountain range. Such an analysis has yet to be completed for the Bridger Mountain Range.

In spite of relatively high levels of human development in the Bridger Range, suitable habitat is still present for the entire suite of native fauna expected to occur in this range prior to European settlement. However, because of the relatively small size, and high level of human development in the Bridgers, this mountain range may no longer provide the large, undisturbed blocks of habitat required by some species. Notably absent from the Bridgers today are species such as the grizzly bear, bighorn sheep, gray wolf, and possibly lynx. Some of the species that no longer occur in the Bridgers were eliminated from large portions of their historic range and are now protected under the ESA. Recovery efforts have increased population levels of some of these species, and they are currently expanding their range so that we might again see species such as the gray wolf and peregrine falcon occupying suitable habitat in the Bridger Mountains. Although some of the large, charismatic species listed above no longer occur in the Bridgers, many large, wide-ranging animals still make regular use of the habitat available in this area. Such species include black bear, mountain lion, wolverine, coyote, bobcat, moose, elk, mule deer, and white-tailed deer.

The Study Area contains a very similar suite of faunal species as that present throughout the Bridger Range. Seasonal weather patterns affect the distribution of wildlife across the landscape. For example, mule deer are present in the existing SUP area during the spring, summer, and fall months, but move onto winter range on the west side of the mountains during the ski area operating season. Likewise, black bears are not found in the SUP area during the ski season, as they are winter hibernators. Some animals however, are likely displaced from the SUP area, or their use patterns are altered, by human activity; both during the ski season as well as during the spring, summer and fall months when dispersed recreation and ski area maintenance activities occur. For example, moose, which are year-round residents in the Bridgers, are rarely seen in the

SUP area during the ski day, but their tracks and scat reveal that they come into the Study Area during off-hours.

Habitat alterations have also likely influenced changes in biodiversity within the SUP area. Clearing and thinning trees to create ski runs has resulted in the permanent modification of forested habitat. The existing SUP area is approximately 1,122 acres of NFS lands. Of this area, approximately 444.2 acres have been modified for ski runs, roads, buildings, and trails. This type of habitat modification may preclude use of the area by species that might otherwise occupy the habitat if it were in a naturally forested condition. Removal of hazardous snags, down logs and lower tree limbs to provide for skier safety also results in habitat modification that could reduce the carrying capacity within the SUP area to support species such as cavity nesters and small mammals that require these habitat components. Snow compaction modifies winter habitat for several species. For example, groomed and heavily skied runs preclude access to subnivean habitat for species such as grouse, pine marten, weasels, mice and voles. Snow compaction can also influence biodiversity by changing the competitive relationship between species. For instance, snow compaction is thought to minimize the competitive advantage of deep snow adapted species such as lynx and wolverine, in favor of more generalist carnivores like coyote, mountain lion, and bobcat.

### *Methodology*

A list of Threatened, Endangered, and Sensitive wildlife species likely to be present in the Study Area was obtained from the GNF biologist, the Bozeman Ranger District, Montana Department of Fish, Wildlife, and Parks (MDFWP), the USFWS, and the Montana NHP. Field surveys were conducted in August of 1996. Habitat type, vegetative cover, and key habitat features were mapped, and habitat of key species was documented.

The wildlife species included in this evaluation have been identified as warranting discussion for one of the following reasons: the species or its habitat is known or is likely to occur in the Study Area; the species or its habitat may be affected by the proposed expansion, the species or its habitat must be addressed as directed by law or policy, i.e., threatened, endangered, and sensitive species, or it is designated as a Management Indicator Species (MIS) by the Forest Service.

In accordance with Section 7(c) of the Endangered Species Act (ESA), a list of Threatened and Endangered species has been requested from the USFWS for the Study Area. Federally listed species that may be present in or near the Study Area include the threatened Canada lynx, threatened bald eagle, and the gray wolf, which has been reintroduced into the Yellowstone ecosystem as a nonessential experimental population. The grizzly bear is a threatened species, but the Study Area is well outside the grizzly bear recovery zone, and there have been no verified sightings in the Bridger Mountain Range for many years.

A determination of the effects from the 2002 Bridger Bowl Master Development Plan Update to grizzly bear, Canada lynx, bald eagle, and gray wolf is presented in the *Biological Assessment for Bridger Bowl Ski Area Master Development Plan* (BA). Since that time, the vegetation and habitat mapping in the Bridger Bowl Study Area has been updated for the EIS, and the scope of the Proposed Action has been reduced slightly as compared to the 2002 Master Plan. A

description of the recent changes to the Master Plan and the current scope of the Proposed Action are contained in Section 2.3.

The Forest Service has identified Management Indicator Species (MIS) in order to maintain adequate habitat to sustain viable populations of all native and desirable non-native fish and wildlife species on the GNF. The condition of these species can be used as a barometer to assess the impacts of management actions on a particular area. Specific management goals, objectives, and guidelines have been developed for each MIS. The Forest Plan lists five MIS that require monitoring as an evaluation of Forest Service actions on wildlife habitat. Of these species, grizzly bear and bald eagle are discussed under the section: Threatened, Endangered, and Proposed Wildlife Species. In addition, elk, goshawk (a R1 sensitive species), and pine marten will be discussed.

A complete list of species included in this analysis, their status, primary habitat association, and probability of occurring in the Study Area, is found in Table 3.5-1. Some species have more than one associated status, which is indicated in the Table.

**Table 3.5-1  
Species Potentially Occurring in the Study Area**

Species Name	Status	Habitat Association	Probability of Occurrence
<b>Threatened and Endangered Species</b>			
Canada lynx ( <i>Lynx canadensis</i> )	T	Typically associated with spruce, subalpine fir, and lodgepole pine forests (Koehler, 1989). Early successional habitat is necessary for foraging and mature forests are necessary for dens (Ruediger et al., 2000).	Not currently known to occur within the Study Area though suitable habitat exists within the northern and southern expansion areas.
Grizzly bear ( <i>Ursus arctos horribilis</i> )	T, MIS	Vast areas of wilderness; a variety of habitats including meadows, wet areas, open slopes with huckleberries (USFWS, 1993)	Grizzly bear use of the Study Area is unlikely. There is no verified evidence of grizzly bear use in the Bridger Mountains in recent decades. Not expected to occur within the Study Area.
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	T, MIS	Almost always found near large bodies of water where primary prey items of fish and waterfowl can be found (Johnsgard, 1990).	Eagles are most commonly observed in the Study Area during their fall migration. The Study Area does not provide suitable nesting or foraging habitat.

Species Name	Status	Habitat Association	Probability of Occurrence
<b>Species Proposed for Listing</b>			
Gray wolf ( <i>Canis lupus</i> )	Non-essential, experimental species treated as P	Key habitat includes big game winter range (Jones et al., 1983). Wilderness; isolation from human disturbance for denning (Paradiso, Nowak, 1982).	Gray wolf was re-introduced into Yellowstone NP (approximately 90 miles south of the Study Area) as a nonessential experimental population. There have been no verified wolf sightings in the Bridger Mtns (Fontaine, Pers. Comm., 1996).
<b>Forest Service Sensitive Species</b>			
Trumpeter swan ( <i>Cygnus buccinator</i> )	FSS	Associated with large bodies of water such as major rivers and lakes.	No suitable habitat occurs within the Study Area
Harlequin duck ( <i>Histrionicus histrionicus</i> )	FSS	Associated with large, clear swiftly flowing mountain streams (Bellrose, 1980).	No suitable habitat occurs within the Study Area
Peregrine falcon ( <i>Falco peregrinus</i> )	FSS	Major habitat requirements include tall cliffs and a body of water where primary prey items of shorebirds and waterfowl can be found (Johnsgard, 1990).	Peregrine falcons are seen during fall migration along Bridger Ridge and in the Gallatin Valley during spring migration. There are no known resident breeding pairs in the Bridger Mountains.
Flammulated owl ( <i>Otus flammeolus</i> )	FSS	Habitat ranges from mature ponderosa pine forest to mixed ponderosa pine/Douglas fir forest. Closely associated with extensive stands of old growth (Dobkins, 1994)	There has been one observation of a Flammulated owl on the west side of the Bridger Mountains (approximately 12 miles from the Study Area) (Jurist, Pers. Comm.). Potentially suitable habitat does not occur within the Study Area.
Black-backed woodpecker ( <i>Picoides arcticus</i> )	FSS	Associated with coniferous forests, usually spruce and fir, and is especially tied to two to five year old burned areas (Dobkins 1994; Short, 1982).	No suitable habitat occurs within the Study Area.
Wolverine ( <i>Gulo gulo</i> )	FSS	Montane forest types of Douglass fir, lodgepole pine, spruce, and subalpine fir (Copeland, 1996). High elevation rock habitat are used as denning habitat in winter.	Known to occur within the Study Area; no documentation of reproductive denning sites.
Northern goshawk ( <i>Accipiter gentiles</i> )	FSS, MIS	Associated with dense mature forests with high canopy cover and multilayered canopy. Small, open areas are used for foraging (Johnsgard, 1990).	Potentially suitable habitat exists within the Study Area. May occur within the Study Area.



Species Name	Status	Habitat Association	Probability of Occurrence
Western big-eared bat ( <i>Corynorhinus townsendii</i> )	FSS	Mesic habitats of coniferous or deciduous forests (Kunz and Martin, 1982). Hibernacula and maternity roosts located in caves, summer roosting in tree cavities and loose bark (Torquemada and Cherry, 1985). Foraging occurs primarily over wet meadows and other areas of water along forest edges.	Suitable foraging and summer roosting habitat present within the Study Area. May occur within the Study Area.
Northern Leopard frog ( <i>Rana pipiens</i> )	FSS	The habitat of the adult frog is the narrow zone between water and grassland. Eggs and tadpoles require clear, clean, freshwater streams.	Suitable habitat occurs within the Study Area. Presence unlikely due to high elevation.
Boreal toad ( <i>Bufo boreas boreas</i> )	FSS, C	Restricted to suitable breeding habitat in spruce-fir forests and alpine meadows. Breeding habitat includes lakes, marshes, ponds, and bogs with sunny exposures and quiet, shallow water.	Suitable habitat exists within the proposed Study Area. May occur within the Study Area.
<b>Management Indicator Species</b>			
Pine marten ( <i>Martes americana</i> )	MIS	Associated with mesic forest types of subalpine fir, spruce, and lodgepole pine.	Known to occur within the Study Area.
<b>Big Game Species</b>			
Elk ( <i>Cervus elaphus</i> )	BG, MIS	Combination of coniferous forest and open habitats; densely forested areas during calving and fall rut. Seclusion from human disturbance important for calving (Thomas, Toweill, 1982).	Known to occur within the Study Area during spring, summer, and fall. Migrate to the west side of the Bangtail Range and the west side of the Bridger Mountains during winter.
Mule deer ( <i>Odocoileus hemionus</i> )	BG	High elevation, diverse, mesic habitats with high quality forage.	Known to occur within the Study Area during the spring, summer, and fall months.
White-tailed deer	BG	Associated with lower elevation riparian habitat, and coniferous forests.	Uncommon within the Study Area, but are known to occur along Bridger Creek.
Moose ( <i>Alces alces</i> )	BG	Dense, subalpine fir and associated shrubby riparian areas.	Known to occur within the Study Area year-round.
Mountain goat ( <i>Oreamnos americanus</i> )	BG	Closely associated with steep, rocky cliffs, pinnacles, ledges, and talus slopes.	Known to occur within the Study Area.
Black bear ( <i>Ursus americanus</i> )	BG	Utilizes a wide variety of habitats including coniferous and deciduous forest, forest edges, meadows, wetlands, and subalpine parkland (Johnson and Cassidy, 1997).	Known to occur within the Study Area.

Species Name	Status	Habitat Association	Probability of Occurrence
Mountain lion ( <i>Felis concolor</i> )	BG	Utilize a wide variety of habitats, disperse great distances, and large home ranges. Typically den in concealed, sheltered locations.	Known to occur within the Study Area
Blue grouse ( <i>Dendragapus obscurus</i> )	BG	Found at lower elevations in semi-open habitats during summer but migrate to higher elevations in winter, feeding primarily on pine needles.	Known to occur within the Study Area.
Ruffed grouse ( <i>Bonasa umbellus</i> )	BG	Closely associated with aspen stands, feeding almost exclusively on aspen buds during winter.	Known to occur within the Study Area.
<b>Other Species of Interest</b>			
Boreal owl ( <i>Aegolius funereus</i> )	**	Habitat ranges from mature mixed deciduous and conifer forest to pure mature conifer stands (Hayward et al., 1987; Holt, 1987). Nesting habitat includes multi-layer canopy, a high density of large trees, and an open understory (Hayward, 1983).	Potentially suitable habitat occurs within the Study Area. May occur within the Study Area. Surveys conducted in the Pine/Slushman drainages in 1992 did not detect any owls.

T = Threatened, P = Proposed, FSS = Forest Service Sensitive, MIS = Management Indicator Species, C = Candidate Species for Federal Listing; \*\* recently removed from the r1 sensitive species list

### 3.5.2 THREATENED, ENDANGERED, AND PROPOSED WILDLIFE SPECIES

#### Threatened Species

##### *Canada lynx (Lynx canadensis)*

Lynx are typically associated with spruce, subalpine fir, and lodgepole pine forests in the mountains of the west (Koehler, 1989). They are well adapted to cold winters and deep snows of northern latitudes in western Montana above 4,000 feet elevation (Koehler et al., 1979). Unlike other carnivores whose diet may be quite varied, lynx prey almost exclusively on snowshoe hares (*Lepus americanus*) (Koehler, 1989). Forest conditions that favor snowshoe hare abundance will benefit lynx. Koehler (1989) found the highest snowshoe hare densities in 10-20 year old stands of lodgepole pine, which is where lynx concentrate their hunting efforts. In these stands, the lodgepole was < 1 inch DBH and stem density was approximately 15,840 per acre, providing forage, escape and thermal cover for the snowshoe hares. There are approximately 77.7 acres of immature lodgepole pine forest within the Study Area. Although lynx are specialized for hunting hares, alternate food sources including tree squirrels, voles, mice and grouse are also important (USDA, 1994b).

Lynx require a mosaic of forest conditions, including early successional habitat for hunting and mature forests for dens. Den sites are typified by lodgepole pine, spruce, and subalpine fir forests older than 200 years with northerly aspects and a high density of down-fall logs (Koehler, 1989). These mature stands for dens were as small as 1-5 acres in size with stringers of connected travel corridors that provide security cover for adults and kittens. There are

approximately 288.7 acres of mature and old growth forest available within the northern and southern expansion areas. The existing SUP area contains approximately 497.2 acres of mature and old growth forest interspersed with naturally open spaces as well as cleared ski trails. Due to the almost continuous ski area activity within the existing SUP area, due to nighttime trail grooming, early morning avalanche control, and daytime operations, the existing SUP area was not considered to contain suitable denning habitat for this project (USDA, 2003).

Physical adaptations, such as large paw size give the lynx a competitive advantage in deep snow conditions over other predators such as bobcats and coyotes. Winter recreation activities that result in snow packing, including grooming of ski trails, could reduce the competitive advantage lynx have over the more generalist predators (USDA, 1994b). There is no documented occurrence of lynx in the Bridger Mountains, Bridger Canyon, or in the Bangtails in databases maintained by MDFWP, Forest Service, or Montana NHP. There have been scattered accounts of lynx to the east of the Study Area in the Crazy Mountains (Fouse, Pers. Comm., 1996) and south in the Gallatin and Madison mountain ranges. The most recent harvest of a lynx in the vicinity of the Study Area occurred in 1994 approximately 15-20 miles south and across a major highway (I-90) from the Study Area (Fager, Pers Comm, 1996). Monitoring efforts have been implemented in the Bridger Range in an attempt to detect the presence of lynx (Wild Things Unlimited, 2003). Since suitable lynx habitat exists in the Bridgers, including the proposed northern and southern expansion areas, this analysis assumes that lynx may be present in the Study Area at some time.

#### South Bridger Lynx Analysis Unit

The Lynx Analysis Unit (LAU) affected by the Bridger Bowl proposal is the South Bridger LAU (SB LAU), which covers an area approximately 17,750 acres (roughly 28 mi<sup>2</sup>) in size, and contains approximately 12,159 acres of lynx habitat. Studies of lynx habitat in the southern part of the range indicate that at least 10 mi<sup>2</sup> (approximately 6,400 acres) of lynx habitat should be present within a LAU to provide sufficient habitat for lynx survival and reproduction (Ruediger et al. 2000:7-4). The SB LAU is sufficiently large to cover the average home range size of a female lynx and contains adequate habitat to support lynx on a year-round basis.

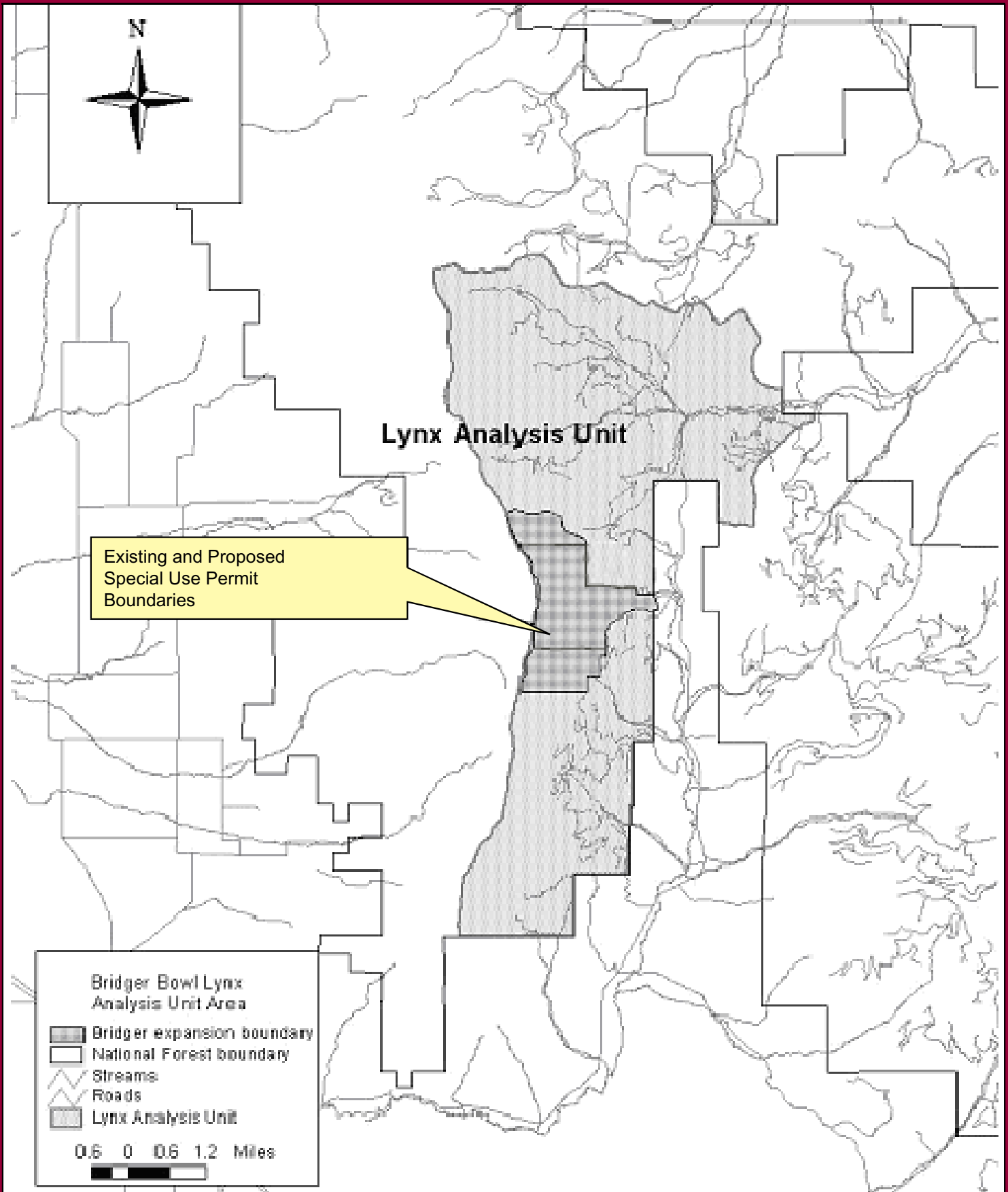
LAU boundaries do not change with individual projects; they remain constant unless biological or ecological information becomes available to suggest better delineation. The SB LAU contains lynx habitat in the southeast portion of the Bridger Range, plus a small amount of lynx habitat in the adjacent Bangtail Mountains. Figure 3-5 displays the SB LAU boundary in relation to the Study Area.

Lynx habitat in an unsuitable condition includes those areas that have experienced some form of disturbance, either natural or man-caused, that severely reduced or eliminated forest cover. Unsuitable lynx habitat in the SB LAU has resulted primarily from past timber harvest for wood production and ski area development. Harvest methods that have produced unsuitable lynx habitat conditions include clearcuts, seed tree cuts, shelter wood and commercial thinning, where 90 percent or more of the forest cover has been removed.

There has been no landscape scale assessment completed for the Bridger Range, so federal actions must limit disturbance so that no more than 30 percent of lynx habitat in the LAU is in an

unsuitable condition. At a small ski area like Bridger Bowl, skiers make use of all the available terrain, often skiing through trees that might otherwise provide suitable lynx habitat. Outside of the ski area, lynx habitat was deemed unsuitable only when all or most of the forest cover had been removed. Considering all lynx habitat in the SB LAU (public and private ownership), there is currently about 2,447 acres, or 20 percent in unsuitable condition.





### *Grizzly bear (Ursus arctos horribilis)*

Grizzly Bears are a wide-ranging and opportunistic species that once occurred in and near riparian woodland and open prairie (Jones et al., 1983). Grizzly bears utilize a wide variety of habitats, depending on the season. During spring, following den emergence, grizzly bears are most likely to be present at lower elevations and follow green vegetation into higher elevations as the season's progress. Their present habitat is in mostly forested mountains with areas sparsely populated by humans.

Bridger Bowl is located approximately 35 air miles north of the grizzly bear recovery zone for the Greater Yellowstone Ecosystem (GYE). The Bridger Range contains security cover and other natural features necessary for wildlife travel corridors, and provides a logical north-south connection between ecosystems. However, grizzly bears have never been known to use the Bridgers as a connecting route between ecosystems. There is no verified evidence of grizzly bear use in the Bridger Mountains in recent decades.

Within the Bridger Bowl SUP area, human use varies seasonally and daily. Seasons of greatest recreation use are winter and summer and the majority of activity takes place during the day. Grizzly bears could potentially utilize the SUP area as part of a larger home range. They may also travel through the area between patches of potentially suitable habitat. However, habitat suitability for grizzly bears is greatly reduced by the existing level of human use within the SUP and surrounding area. Given the distance of the nearest grizzly bear recovery zone and this reduced habitat suitability, regular use of the SUP area by grizzly bear is considered unlikely. For these reasons, the USFS has determined not to analyze grizzly bear for the proposed project (USDA 2003).

### *Bald eagle (Haliaeetus leucocephalus)*

Bald eagle breeding habitat requirements include open areas near a river or large lake with an adequate supply of moderate sized to large fish (Johnsgard, 1990). Nesting sites are usually in the fork of a large tree within one mile of water, which is somewhat protected from disturbance during the nesting period. Bald eagles will also eat rabbits, waterfowl, and carrion. Winter habitat is dependent upon weather conditions and a source of open water, as well as the availability of carrion.

Eagles are frequently observed in the winter and early spring along the east Gallatin River, located eleven miles west on the other side of the Bridger Mountains and along Flathead Creek eleven miles to the northeast (Brelsford). Bald eagles are most commonly observed in the Study Area during their fall migration. The Study Area does not provide suitable nesting or foraging habitat for bald eagles. The USFS has determined that the Proposed Action would have no effect on bald eagles (USDA 2003).

### **Proposed Species (Nonessential Experimental Population)**

#### *Gray wolf (Canis lupus)*

In 1995, the gray wolf was reintroduced into Yellowstone National Park (approximately 90 miles south of the Study Area) as a nonessential experimental population. Under Section 10(j) of the

Endangered Species Act Amendments of 1982 (16 U.S.C. 1531-1540), the Secretary can designate reintroduced populations established outside the species current range but within its historical range as “experimental.” Reintroduction of the experimental population must be separate geographically from non-experimental populations of the same species, and further the conservation of the species. An experimental population designated as “nonessential” is considered to be nonessential to the continued existence of the species. Nonessential experimental populations outside of the National Wildlife Refuge System or National Park System are treated as though they are a species proposed for listing.

Historically, gray wolves occupied a variety of habitat types, suggesting a broad array of habitat tolerances. Key components of suitable habitat for gray wolves include a year-round large ungulate and alternative prey base, space with minimal human encroachment and contact, and suitable denning and rendezvous sites (USFWS, 1987). Key habitat for the gray wolf includes big game winter range in which prey can be found in high densities (Jones et al., 1983). The Study Area is not a wintering area for most big game due to deep snow. There have been no gray wolf observations within the Bridger Mountains for several decades (Fontaine). The USFS has determined that the Proposed Action would have no effect on gray wolves (USDA 2003).

### 3.5.3 FOREST SERVICE SENSITIVE WILDLIFE SPECIES

The following species are listed as sensitive for the GNF:

#### *Trumpeter swan (Cygnus buccinator)*

The trumpeter swan is associated with large water bodies such as major rivers and lakes. There is no suitable habitat for trumpeter swans in the Study Area; as a result, this species is not analyzed in detail in this document.

#### *Harlequin duck (Histrionicus histrionicus)*

Harlequin ducks are associated with large, clear, swiftly flowing mountain streams (Bellrose, 1980). There is no suitable habitat for harlequin ducks in the Study Area; as a result, this species is not analyzed in detail in this document.

#### *Peregrine falcon (Falco peregrinus)*

In August of 1999, the peregrine falcon was de-listed by the USFWS and is no longer considered an endangered species (63 FR 45446-45463). Forest Service policy requires that species removed from the federal list of threatened and endangered species be included on the Forest Service sensitive species list for at least five years following de-listing.

The most common habitat characteristic for the peregrine falcon is the presence of tall cliffs (>50 meters) (Johnsgard, 1990). The other major habitat requirements include a source of water, which is almost always close to the nest site, and a localized and adequate source of small to medium sized birds. Prey species include shorebirds and waterfowl; however, doves, pigeons, grouse and passerines are also included.

Portions of the Bridger Mountain Range represent potential nesting habitat and is designated as such in the Forest Plan. Peregrine falcons are seen during fall migration along Bridger ridge and in the Gallatin Valley during spring migration (Flath, Pers. Comm., 1996). However, there are no known resident breeders in the Bridger Mountains. The USFWS and the MDFWP indicated no particular concerns for peregrine falcons relative to the project as proposed (Vandehey, Pers. Comm., 1996; Flath, Pers. Comm., 1996).

#### *Flammulated owl (Otus flammeolus)*

Flammulated owl habitat ranges from mature ponderosa pine forest to mixed ponderosa pine/Douglas fir forest and perhaps other montane coniferous forests, to a lesser extent, below 6,000 feet (Johnsgard, 1988). These owls nest in woodpecker excavated (sometime natural) cavities in pine, larch, fir, and occasionally aspen (Dobkins, 1994). They feed exclusively on invertebrates: insects, scorpions, spiders, and centipedes, only rarely taking small mammals or birds. Flammulated owls are closely associated with extensive stands of old growth (Dobkins, 1994). This species has disappeared from portions of its previous breeding range where such habitats have been highly fragmented. These owls avoid cutover areas and forests younger than 100 years old (Reynolds and Linkhart, 1987). Flammulated owls nest from mid-May through early August (USDA, 1994a).

There has been one observation of a flammulated owl on the west side of the Bridger Mountains, approximately 12 miles from the Study Area (Jurist). Field surveys in 1992 did not reveal potential flammulated owl habitat within the Study Area due to elevation and the highly fragmented Douglas-fir forest.

#### *Black-backed woodpecker (Picoides arcticus)*

The black-backed woodpecker is associated with coniferous forest, usually spruce and fir, and is especially tied to 2 to 5 year old burned areas (Dobkins 1994, Short 1982). A three-year breeding bird survey was conducted south of Bridger Bowl in the Pine/Slushman drainages, and no black-backed woodpeckers were observed (Moore, 1996). During field surveys conducted in August of 1996, numerous northern flickers, and a three-toed woodpecker were sighted, but no black-backed woodpeckers were detected. The Bostwick Canyon fire burned over 1,200 acres in 1991, just over the ridge from Bridger Bowl. No surveys for black-backed woodpeckers have been conducted in this burn; however, due to the age of the burn, it would not be expected to find black-backed woodpeckers using the area to any considerable degree. Large, recent fires in the vicinity of Bridger Bowl would provide suitable habitat for the black-backed woodpecker which could result in occasional visits to the Study Area.

#### *Wolverine (Gulo gulo)*

Little is known about specific habitat relationships for wolverines in western North America, but they are considered forest carnivores associated with relatively large tracts of undisturbed, often remote, coniferous forest habitat (Banci, 1994). Wolverines are wide-ranging animals. In Montana, average home range size varies from 100 km<sup>2</sup> (about 38 miles<sup>2</sup>) for females with young, to 422 km<sup>2</sup> (about 163 miles<sup>2</sup>) for adult males (Hornocker and Hash, 1981). Home range sizes are likely attributed to wide-ranging foraging bouts for both sexes, and the much larger



home range size of males is primarily a function of wandering in search of females during the summer breeding season. These large home range sizes coupled with low reproductive rates result in naturally low densities of wolverines within occupied habitat (Conard, 1999).

Although they are physiologically carnivores, wolverines have a wide variety of food items in their diet. The wolverine's foraging strategy is that of a habitat generalist. In the snow-free months, wolverines are opportunistic omnivores, taking advantage of the availability of food sources such as berries, small mammals, and insects (Banci, 1994).

In winter, wolverines rely heavily on scavenging carrion from large mammal carcasses (Banci, 1994). Elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*) are present within the Study Area during the summer and fall, while moose (*Alces alces*) and mountain goat (*Oreamnos americanus*) are present year-round. Natural factors such as old age, disease, accidents, and predation by large carnivores, as well as mortality from hunting by humans, can produce ungulate carcasses for wolverines to utilize over winter. Wolverines might also feed on small mammals such as snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), marmot (*Marmota flaviventris*), pika (*Ochotona princeps*) and porcupine (*Erithizon dorsatum*). Since wolverines are primarily opportunistic habitat generalists when it comes to feeding, foraging habitat is not considered to be a limiting factor in the Bridger Mountain Range.

Pregnant females select natal dens, where kits are born in mid-winter. The majority of known natal den sites involve areas of deep snow accumulation, where snow tunnels are often part of the infrastructure (Pulliainen, 1968; Magoun, 1985; Roskaft, 1990; Copeland 1996). Den sites have also been reported in hollow logs, tree cavities, abandoned beaver lodges, under down logs, beneath the root wads of fallen trees, among boulders, on rock ledges, in old bear dens, and in log jam debris. Den sites located in forested habitat have typically been associated with spruce (*Picea* spp.) types (Banci, 1994). Natal dens may be abandoned for a number of reasons including snow melt, infestation by parasites, to avoid detection by predators, or to avoid disturbance from human intrusions (Copeland, 1996). Females disturbed at a den site will move their kits, often to less suitable, or even apparently unsuitable, sites (Pulliainen, 1968).

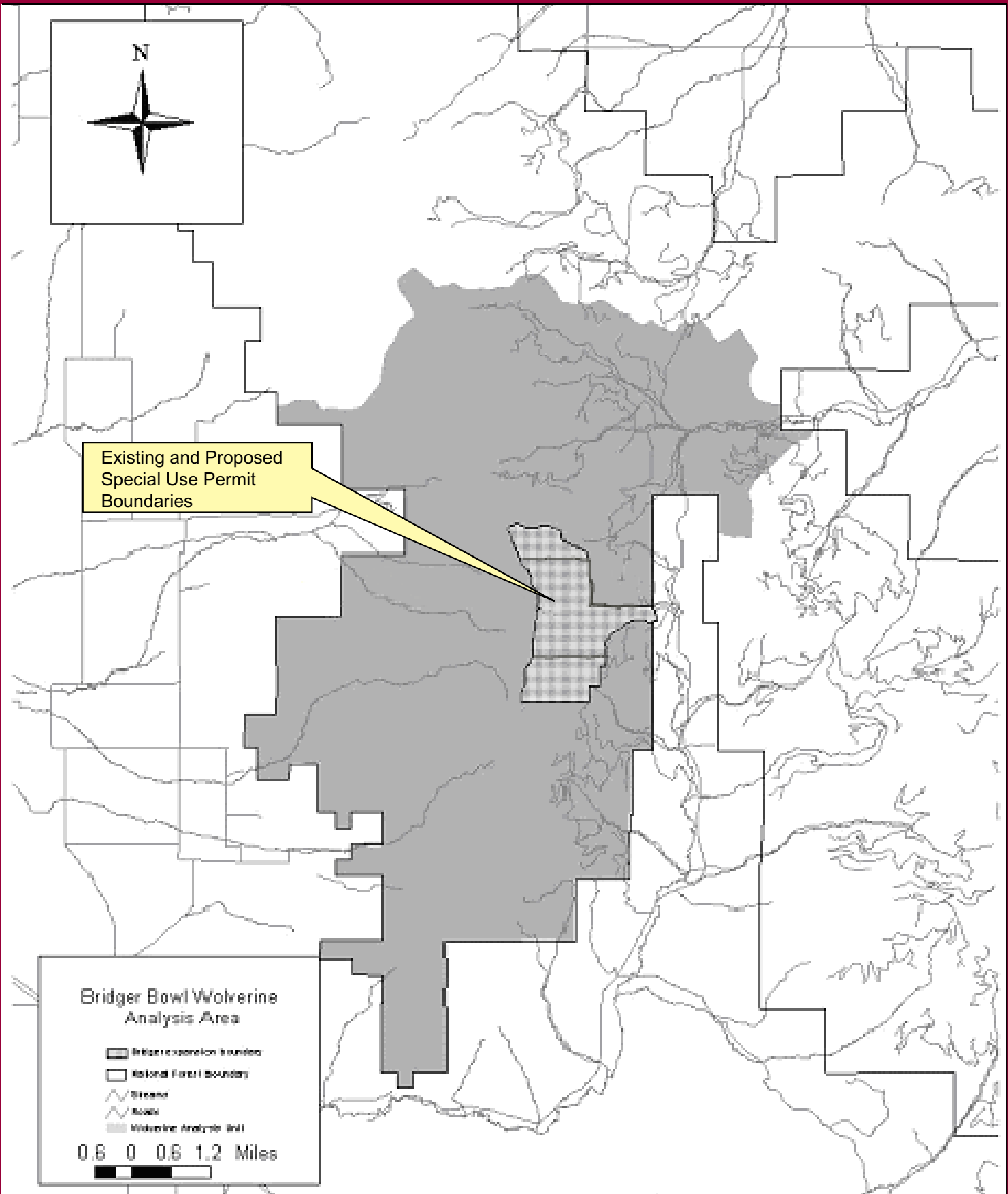
Suitable denning habitat is available on both sides of the Bridger Range, although the east side produces heavier snow loading, which may be preferable for tunneling associated with den sites. Talus slopes and cirque basins seem to provide key denning habitat components for wolverines (Copeland, 1996), and the upper slopes in the Bridger Mountains provide these habitat features. The Bradley Meadows area appears to provide higher quality denning habitat than the Slushman drainage, due to greater availability of mature to over-mature forest habitat, northerly aspects that provide snow conditions more conducive to tunneling, and vegetative and topographic conditions that provide greater protection from wind and freeze/thaw events. There are a total of 435 acres of existing denning habitat for wolverine (including talus, mature, and old growth subalpine fir and spruce forest) available within the Study Area. Currently, approximately 159 acres of this habitat is being indirectly affected by ski area operations, leaving approximately 276 acres of habitat in an undisturbed condition.

Wolverines are known to occur in the Bridger Mountain Range (Dixon, Pers. Comm., 1998) and have been detected (by tracks, sightings and photos) on a fairly consistent basis in the Study Area, most notably within the proposed SUP expansion areas (Wild Things Unlimited, 2003).

The Bridger Range is a relatively small, isolated mountain range. Considering the limited land base and the large home range size of wolverines, there may be only a few individual wolverines occupying habitat in the Bridger Range at any one time. However, wolverines in the Bridger Range are considered part of a larger population that includes most of southwest Montana (Giddings) and part of a genetically identifiable subpopulation that includes the Gallatin Mountain Range to the south (Cigelski, 2002). Wolverines have large home ranges, and it is believed that exchange does occur between populations in the Bridgers and the Big Belt Mountains to the north (Giddings)

### Wolverine Analysis Area

For the purpose of a larger scale analysis, a Wolverine Analysis Area was delineated around the Study Area (see Figure 3-6). The Wolverine Analysis Area includes timber compartments 504 and 515 plus portions of compartment 503 (sub-compartments 04, 05, 06 and 07). This area was chosen because it is of sufficient size (34,418 acres) to contain the average home range of a female wolverine with young and contains all activities associated with the Proposed Action. The Wolverine Analysis Area spans both sides of the Bridger Range, with about half the acreage located on the east side where better denning habitat occurs, and the other half on the west side, where big game winter range could provide winter/denning season food sources in the form of ungulate carcasses. Based on GIS analysis, approximately 8 percent (2,588 acres) of the Wolverine Analysis Area contains suitable denning habitat for wolverines. The Study Area currently contains a total of approximately 435 acres of denning habitat which is 16.8% of the denning habitat available in the Wolverine Analysis Area. Within the Study Area, 159 acres are indirectly affected by ski area operations (grooming, skiing, avalanche control) leaving approximately 276 acres of suitable undisturbed denning habitat within the Study Area (see Table 3.5-2)



### *Northern goshawk (Accipiter gentilis)*

In addition to being designated as an MIS in the Forest Plan, the northern goshawk was added to the R1 Sensitive Species List in 1999. These birds are associated with dense mature forests with 80-88 percent canopy closure and a multilayered canopy (Johnsgard, 1990). Small, open areas are used for foraging. Goshawks feed on birds and mammals of moderate to large species, primarily grouse, snowshoe hare, cottontail rabbits and squirrels. Nesting sites are usually near a source of water on moderate slopes with a northerly aspect. Suitable nesting habitat can be found in Douglas fir, spruce-fir and lodgepole cover types, however, in the northern Rockies nests were located in Douglas fir forests and lodgepole pine stands more often than any other tree species (Montana Partners in Flight 2004). The Study Area contains approximately 801.2 acres of mature and old growth forest though not all of it is suitable nesting habitat due to the small size of some forest patches (see Figure 3-4) and variable canopy cover. The northern expansion area contains approximately 193.5 acres of contiguous mature and old growth spruce-fir and lodgepole pine forest and the southern expansion area contains approximately 95.2 acres of mature and old growth mixed conifer and Douglas fir forests.

Goshawks have a large home range and appear to be sensitive to fragmentation (Flath, Pers. Comm., 1996). They are known to nest in the Bridger and Bangtail Mountains. During an August 1996 survey, there were several unverified sightings of a large gray hawk. Red-tailed hawks and golden eagles were also observed. Field surveys were conducted after the nestling period, but it is unknown if goshawks are nesting in the Study Area. There is a goshawk nest site within approximately one mile of the Slushman drainage. This nest was known to be active between 1984 and 1988. The site was surveyed in 1992 and found to be inactive; it has not been actively monitored since 1992 (Dixon, Pers. Comm., 1998). Surveys conducted for goshawk in the summer of 2000 did not locate any individuals within the Study Area (USFS 2000); however, suitable habitat exists within the dense, mature forests in the Study Area and goshawks may occur in the area.

### *Western big-eared bat (Corynorhinus townsendi)*

The western big-eared bat is typically found in mesic habitats of either coniferous or deciduous forests, and it may have some affinity to riparian areas (Kunz and Martin, 1982). In Montana, these bats generally inhabit caves for hibernacula and maternity roosts. This species is non-migratory and exhibits a high degree of site fidelity, returning year after year to the same maternity roost. The greatest threat to western big-eared bat populations is destruction or alterations of maternal and hibernacula roosting sites (Torquemada and Cherry, 1995). Feeding sites primarily occur over wet meadows and other areas of water along forest edges. Summer roosting sites can also be in tree cavities or behind loose bark. There are no known caves in the Study Area. Western big-eared bats could occur in the area; however, no surveys have been conducted in the Bridger Mountains. The Bradley Meadows area may provide foraging habitat for this species, as it consists of mesic coniferous forest with multiple seep areas and contains the upper reaches of SF Brackett Creek.



### *Northern leopard frog (Rana pipiens)*

During ongoing analysis for the Proposed Action in March of 1999, the northern leopard frog was added to the Region 1 sensitive species list. The northern leopard frog is found across the prairie regions of the eastern two-thirds of Montana east of the Continental Divide. It was formerly present in intermountain valleys west of the Continental Divide, especially in the Flathead and lower Clark Fork river drainages, but in recent years has been documented at two western sites (Montana Fish, Wildlife and Parks website - A 03/24/04). This frog has been documented at elevations up to 6,700 feet. Habitats utilized by the northern leopard frog in Montana include low elevation and valley bottom ponds, spillway ponds, beaver ponds, stock reservoirs, lakes, creeks, pools in intermittent streams, warm water springs, potholes, and marshes. There is no evidence that this species has ever occupied high elevation wetlands in Montana sites (Montana Fish, Wildlife and Parks website - A 03/24/04).

The northern leopard frog is known to have a wide distribution and is documented within the Madison/Missouri River drainage. There is suitable habitat around the wetlands and seeps in the northern expansion area, and this species has recently been documented within the Study Area (B. Shepherd, Montana Fish, Wildlife, and Parks, Pers. Comm.). It is possible that the occasional individual may occur within the Study Area however this is expected to be unlikely due to the high elevation (above 6500 feet) of the available suitable habitat.

### *Boreal toad (Bufo boreas boreas)*

During the ongoing analysis for the Proposed Action in March of 1999, the boreal toad was added to the Region 1 sensitive species list. In addition, the USFWS added the boreal toad to its list of candidate species in October of 1999 (64 FR 57533-57547). This species is known to exist within western Montana and Yellowstone National Park and specimens have been collected at elevations up to 9220 feet (Montana Fish, Wildlife, and Parks website - B 03/24/04).

Boreal toads are known to occupy a diverse range of habitat types, from wetlands and aquatic environments during breeding season to sagebrush meadows and forested areas later in the year. Occurrences at high elevation ponds and fens at or near treeline have been reported (Montana Fish, Wildlife and Parks website - B 03/24/04). It is known that the boreal toad migrates between aquatic breeding and terrestrial non-breeding habitats. Movement patterns are highly variable, with some individuals remaining in the same location for several days, then moving 50 meters or more on several consecutive nights (Montana Fish, Wildlife and Parks website - B 03/24/04). Despite the availability of suitable habitat there is no documented presence of boreal toads within the Study Area (State of Montana, NHP Data Base, 1999). Forest cover has been noted in aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir forests (Montana Fish, Wildlife and Parks website - B 03/24/04).

Generally, boreal toads are active during the day and night; juveniles are mostly diurnal while adults tend to be nocturnal except in spring. The active period typically begins in April or May and extends to September or October, depending on elevation and latitude (Montana Fish, Wildlife and Parks website - B 03/24/04). In Montana, records extend from late April to early October (Montana Fish, Wildlife and Parks website - B 03/24/04).

Suitable habitat for boreal toad exists in the wetlands, springs, and seeps within the Study Area and although there have not been any documented sightings the boreal toad is likely to occur within the Study Area.

#### 3.5.4 MANAGEMENT INDICATOR SPECIES

##### *Pine marten (Martes americana)*

Marten are a management indicator of old growth-dependent species in mesic forest types. They are associated with subalpine fir, spruce and lodgepole pine habitats. Martens are active predators of many small forest mammals including squirrels and snowshoe hares but primarily mice and voles (Jones et al., 1983). Marten have been observed using alpine areas and utilize forest openings if there is sufficient down wood to provide cover (Csuti et al 2001). The Study Area contains a total of 785.9 acres of suitable mature and old growth pine marten habitat, and the species is known to occur there (Dixon, Pers. Comm., 1998).

##### *Migratory birds*

Migratory birds are those species that regularly breed in continental North America and winter in a variety of other locations, typically in Central and South America and the Caribbean.

Widespread declines in populations of many migrants have intensified interest in avian conservation and resulted in policy direction to evaluate the impact of proposed activities on the nesting habitats of these species.

Migratory birds occur in a wide variety of habitat types including immature, mature, and old-growth forests. However, in the relatively arid western United States, densities of migratory birds are highest in riparian areas, with coniferous forests being the second-most used habitat by this assemblage of species (Saab and Rich, 1997).

Migratory bird species are protected from harm under the Migratory Bird Treaty Act (16 USC 703-711). A January 2001 Executive Order requires federal agencies to ensure that environmental analyses of federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

#### 3.5.5 GAME BIRDS AND MAMMALS

The species listed in Table 3.5-3 occur in the Study Area during at least a portion of the year. The following sections provide detailed information regarding the presence of individuals and their habitat within the Study Area.

**Table 3.5-3**  
**Big Game and Upland Game Birds Occurrence in the Study Area**

Species	Comments
Mule deer	Observed during the spring, summer, and fall months
White-tailed deer	Observed during the Summer months
Elk	Observed during the spring, summer, and fall months
Moose	Observed year-round
Mountain goat	Observed along Bridger ridge only
Mountain lion	Distribution changes according to prey species distribution
Black bear	Observed during summer months
Blue and Ruffed grouse	Observed year-round

Source: Forest Service

#### *Elk (Cervus elaphus)*

Elk is a species that occurs throughout the Bozeman Ranger District. They are a heavily hunted big game species and demand extensive management attention. Elk are primarily found in coniferous habitats throughout the year. They generally use high elevation open parks during the summer months and densely forested areas during calving, the fall rut, and hunting season. Foraging habitat typically includes open canopy forest, herbaceous and shrub meadows where grasses, sedges, forbs, and browse can be easily accessed. In the winter, elk use lower elevation and semi-open southern exposure habitats (Maxwell). Elk cow/calf groups and a single bull were observed in the Study Area during an August 1996 survey. A spring was noted near tree line in the Study Area that was heavily used by ungulates. Elk calving occurs within the Study Area between approximately May 15 and July 15 (Pac, Pers. Comm. 1996).

The Bridger Bowl SUP area provides important spring, summer, and fall range for elk (Pac, Pers. Comm., 1996). The Study Area does not provide for winter elk habitat due to deep snow accumulation. Elk have been observed in the winter on the westside of the Bangtail Range and the west side of the Bridger Mountains. There is no known exchange between the Bridger and Bangtails elk herds. Although elk numbers in the Bangtails have been on an increasing trend, elk that summer in the Bangtails generally winter at lower elevations on the east side of the Bangtails. Some elk that summer in the Bridgers are known to winter in the Battle Ridge area, but do not move all the way into the Bangtails (Lemke).

#### *Mule deer (Odocoileus hemionus)*

Mule deer are a featured management species in the Bridger Mountain Range and extensive research has been conducted over the last 30 years (Pac et al., 1991). The Bridger Bowl SUP area provides important spring, summer, and fall range for mule deer (Pac, Pers. Comm., 1996). Mule deer occur in the Study Area during the late spring and summer months and are known to calve within the Study Area between May 15 and July 15 (Pac, Pers. Comm. 1996). The population moves out of the area during October and November, dispersing to two distinct

wintering areas: one at the southern end of the Bridger Mountains and the other on the eastside of the Bangtail Mountains along Brackett Creek. Distribution of mule deer during spring, summer, and autumn centers on areas characteristic of high precipitation zones. These areas are high in elevation, and have diverse-mesic habitats with high quality forage (Pac et al., 1991). The Study Area provides good habitat and mule deer use was prominent during field surveys.

*White-tailed deer (Odocoileus virginians)*

White-tailed deer were not observed and are not common in the Study Area, but they do occur along Bridger Creek. These deer tend to use lower elevation riparian habitat, but their populations are expanding and white-tailed deer are now seen along first order streams in predominately coniferous habitats (Pac, Pers. Comm., 1996).

*Moose (Alces alces)*

Moose occur in the Study Area as noted during August 1996 field surveys. They generally winter as individuals or in small social groups. Key habitat for moose is dense subalpine-fir and associated shrubby riparian areas, which is prevalent in the Study Area (Pac, Pers. Comm., 1996). Due to the lush nature of the vegetation in the area, the Study Area provides high quality year-round habitat for moose (Pac, Pers. Comm., 1996).

*Mountain goat (Oreamnos americanus)*

Mountain goats use the full extent of Bridger ridge. They were introduced between 1969 and 1970, and they maintain a population of around 60-100 goats. The high-elevation, rocky terrain associated with the ridge of the Bridger Range provides year-round habitat for mountain goats. A small segment of the population (10-20 animals) traditionally winters south of the ski area on the east face of Saddle Peak. The majority of the population winters north of the ski area in the vicinity of Flathead Pass (Pac, Pers. Comm., 1996). Goat tracks have occasionally been seen along the ridge within the existing ski area boundary and also within the proposed expansion areas to the north and south during the late ski season (March-April) (Dixon, Pers. Comm., 1998).

*Black bear (Ursus americanus)*

Black bear occur in the Study Area as noted during the August 1996 field survey. Black bear are generally associated with coniferous habitats, feeding on grasses and forbs in the summer months and berries and pine nuts in the fall. Bears hibernate on steep north facing slopes around 7,000 feet elevation from November to April (Pac, Pers. Comm., 1996).

*Mountain lion (Felis concolor)*

Mountain lion occur throughout the Bridger and Bangtail Mountain ranges. Their primary prey source is elk and mule deer. There has been a significant increase in mountain lion numbers, primarily due to the attitude shift in predator control that has occurred in recent years (Pac, Pers. Comm., 1996). Mountain lion seasonal distribution is somewhat determined by prey species. Lions are likely to be present in the Study Area during the summer months; tracks indicate at



least occasional use of the area just north of the proposed expansion into Bradley Meadows in winter (Dixon, Pers. Comm., 1998).

*Blue and Ruffed grouse (Dendragapus obscurus) (Bonasa umbellus)*

Both species were observed during the field surveys. Ruffed grouse are closely tied to aspen stands and rely heavily on aspen buds as a winter food source. There are approximately 15.3 acres of aspen available within the Study Area located entirely around the lower elevation base area. Blue grouse are found at lower elevations in semi-open habitats during the summer months, but migrate to higher elevations in the winter. Winter food primarily consists of conifer needles. Skiers often encounter blue grouse along the ridge and upper portions of the ski area (Bridger Bowl Avalanche Patrol, 2003).

### 3.5.6 OTHER SPECIAL INTEREST SPECIES

The Bridger Range acts as a funnel for migrating raptors, as westerly winds create updrafts along the north-south spine of the mountains. The birds utilize these "thermals" to soar, which helps them conserve energy during the trip south. This major migration route serves the largest known concentration of migrating golden eagles in the lower 48 states. As many as seventeen different raptor species have been observed along this route, directly above Bridger Bowl, including bald eagles, peregrine falcons, northern harriers, sharp-shinned hawks, Cooper's hawks, red-tailed hawks, and American kestrels (HawkWatch International, 1991-1997).

*Boreal owl (Aegolius funereus)*

The boreal owl was originally included in the 1999 DEIS as a Forest Service Sensitive species. Based on multi-year survey results, the boreal owl was removed from the Northern Region Sensitive Species list in March 1999.

Boreal owl habitat ranges from mature mixed deciduous and conifer forest to pure mature conifer stands (Hayward et al., 1987, Holt, 1987). Characteristic nesting and calling sites include multiple canopy layers, a high density of large trees (>15" dbh), and an open understory (Hayward, 1983). Palmer (1986) found that ground cover was mostly composed of *Vaccinium* and *Arnica* species, which also supports the owl's primary food source – red-backed voles (*Clethrionomys gapperi*). Boreal owls are cavity dependent, typically using old woodpecker holes, especially those of the northern flicker (*Colaptes auratus*). The typical overstory of boreal owl habitat is made up of mixed coniferous forest with a subalpine fir understory, and it generally contains 8 to 40 snags per acre, ranging from 12-20 inches in diameter.

On the GNF, boreal owls have been recorded in lodgepole pine, lodgepole/Douglas fir, and subalpine fir dominated stands, above 6,000 feet elevation. Surveys were conducted in the Pine/Slushman drainages in 1992, but no boreal owls were detected (Brelsford, 1992).

The forested component of the Bradley Meadows area appears to provide suitable boreal owl habitat, but no surveys have been conducted in this area, so their presence north of Bridger Bowl is unknown.

### 3.6 FISHERIES

The Forest Plan identifies one general goal statement associated with fish habitat management; “to maintain and enhance fish habitat to provide for an increased fish population.” The Forest Plan has several objectives that address fisheries resources. Fish habitat should be managed by application of best management practices (BMPs), and management standards have been set to mitigate impacts occurring to the fishery resource from land use activities. Special considerations would be given to high quality water leaving the Forest to provide for the downstream “Blue Ribbon” trout streams; therefore, management of timber within riparian zones would be designed to maintain or improve fish habitat.

The Forest Plan further refines this direction by providing Implementation Guidelines, which identify specific management requirements for various stream classes. Streams are classified in the GNF as Class D streams if no fish species are present. The main emphasis in Class D streams is to maintain geomorphic integrity without excessive downstream sediment discharge. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates (Story, 2003).

Streams are classified in the GNF as Class A streams if sensitive fish species are present. According to GNF guidelines, to protect Class A streams, sediment increases should not exceed 30 percent above natural rates (Story, 2003). Additional guidance for the management of streams with populations of westslope cutthroat trout and Yellowstone cutthroat trout is contained in the Land-use Strategy for Implementation of the 1999 Memorandum of Understanding and Conservation Agreement for westslope cutthroat trout in Montana (1999 MOU). The pertinent portion of the 1999 MOU is as follows:

*The Memorandum of Understanding and Conservation Agreement (MOUCA) for westslope cutthroat trout in Montana includes as objectives 1) protecting all pure westslope cutthroat trout populations; and, 2) ensuring the long-term persistence of westslope cutthroat within their native range. The Land-Use Strategy for Implementation of the 1999 Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana (Strategy) for the MOUCA, adopted by the Forest Service (FS) and Bureau of Land Management in 2002, further defines how the MOUCA will be implemented by federal land management agencies. For new activities, the Strategy stipulates that the FS will 1) provide watersheds supporting conservation populations of westslope cutthroat trout with the level of protection necessary to ensure their long-term persistence; 2) defer any new federal land management action if it cannot be modified to prevent unacceptable aquatic/riparian habitat degradation; and 3) maintain westslope cutthroat trout habitat at 90% of optimum habitat conditions. When this 90% of optimum condition criteria is not met, only activities resulting in habitat improvement are to be considered. The Strategy also states that FS Biological Evaluations (FSM 2670) prepared for new activities should, in most cases, conclude that there will be a beneficial effect or no effect to the westslope cutthroat trout population or its habitat. This strategy was adopted by the GNF for both Yellowstone and westslope cutthroat trout.*

The GNF uses sediment modeling to determine consistency with this guidance, where sediment delivery to streams shall not exceed 30 percent over natural levels in order to ensure that aquatic habitat capability is not degraded beyond 90 percent of optimum conditions.

### 3.6.1 THREATENED AND ENDANGERED FISH SPECIES

According to Forest Service field surveys and Forest Service and USFWS computer databases, there are no threatened or endangered fish species in the Study Area (Barndt, Pers. Comm., November 17, 2003).

### 3.6.2 FOREST SERVICE SENSITIVE AND MANAGEMENT INDICATOR FISH SPECIES

#### *Fisheries Habitat*

SF Brackett Creek is a second order tributary to the main stem of Brackett Creek, which is a tributary to the Shields River. The upper end of the South Fork Brackett Creek is an intermittent stream in its upper reaches. The upper portion of SF Brackett Creek drainage contains a high density of springs and seeps creating many small, wet, and heavily vegetated boggy areas. These areas provide a high degree of sediment filtration capability to the drainage. A spring located about 200 yards upstream of FS Road 631 in T1N-R7E-Section 18 provides sufficient volume to create perennial flows. This inherently stable A3/A4 channel type is heavily vegetated with alder and perennial vegetation. This high gradient riffle dominated channel at the upper end of SF Brackett Creek does not possess the needed pool habitats and channel development to support a resident fish population. Fish presence begins lower in the drainage in T1N-R7E-Section 8 where the channel converts to a lower gradient B4 channel type near the GNF boundary. A beaver dam complex in the lower portion of SF Brackett Creek provides high quality pool habitats needed for overwintering fish.

Maynard Creek is a second order tributary to Bridger Creek, which is a tributary to the East Gallatin River. Lower Maynard Creek in T1N-R7E-Section 19 shows evidence of past high levels of accelerated sediment delivery. Heavily embedded substrates and high levels of deposited sediment and clay exist in backwater areas. No documentation of fish species presence exists for Maynard Creek. A small reservoir on Maynard Creek has been periodically stocked with rainbow trout. Poor channel development and steep gradients limit fish inhabitation of this stream upstream of the reservoir, which serves as a sediment trap for the drainage; extensive sediment deposition was noted downstream of the outlet of the reservoir.

The South Fork of Slushman Creek was also inspected. The upstream end of this very small (<1 cfs), steep A2/A3 channel type stream is heavily vegetated with willow trees and contains a high component of boulder and large cobble making the stream channel very stable. In addition, there is no documented presence of fish in Slushman Creek.

Both Maynard and Slushman Creeks are tributaries to Upper Bridger Creek. No sensitive fish species are documented present in Bridger Creek as of 2000 (GNF, District Files, 2000). Westslope cutthroat trout and fluvial arctic grayling were historically present in the upper Missouri River basin, which could have included Bridger Creek; however, 5,200 Big Hole River Arctic Grayling were stocked in the West Gallatin River during 1992, and about 10,000 were stocked in 1993 (FAGW, 1993). A few of these tagged grayling have been accounted for in the

East Gallatin River. Brown, rainbow, and brook trout are also known to be present in Bridger Creek.

SF Brackett Creek is classified as a Class A stream in the GNF due to the presence of Yellowstone Cutthroat Trout in the lower reaches of its drainage. The estimated annual sediment yields in SF Brackett Creek under existing conditions is 89.8 tons per year (see Table 3.2-3), which is 8.2 percent above natural conditions (Story, 2003). The existing water quality of SF Brackett Creek is within GNF “30 percent above natural conditions” standard for Class A streams. Based on inspections of fish habitat and riparian area conditions, along with current sediment delivery rate estimates, SF Brackett Creek currently provides habitat at a level greater than the 90 percent capability requirement in the 1999 MOU with the Bureau of Land Management.

Maynard, Upper Bridger, and Slushman Creeks are considered Class D streams in the GNF since there is no documented presence of fish in these drainages. The sediment yield to Upper Bridger Creek and Slushman Creek have been increased above natural rates (33 – 27 percent) due to road building and timber harvest in the lower part of each drainage on NFS land and other privately owned land. Maynard Creek, which flows entirely through existing Bridger Bowl base area, has had a substantial increase (77 percent) in sediment yields above natural rates due to historic building, road, and ski trail construction. The sediment yield in Maynard Creek is expected to decrease over time as historic base area disturbances continue to recover hydrologically. The estimated sediment yields to these three streams for existing conditions do not exceed the GNF standard of “100 percent above natural conditions” for Class D streams (Story, 2003).

#### *Yellowstone cutthroat trout (Oncorhynchus clarki bouvieri)*

Yellowstone cutthroat trout are indigenous to the Yellowstone River and its tributaries. Due to cross breeding with rainbow trout, few pure populations remain, and these populations are restricted to small headwater streams. The Forest Service electro-fished the lower portion of SF Brackett Creek in 2000, and has found a population of Yellowstone cutthroat trout (see Table 3.6-1) (GNF, District Files, 2000). SF Brackett Creek begins in T1N-R6E-Section 13, the Bradley Meadows area of the Study Area. There are four isolated populations of Yellowstone cutthroat trout in the northern portion of the Bridger Mountains that are highly vulnerable to cumulative effects of development along these tributaries.

Only 36 genetically pure stream dwelling populations of Yellowstone cutthroat trout are known to exist within the state of Montana encompassing less than 10 percent of their historic range. Causes for decline throughout their historic range include introduction of exotic species, reduction of habitat quality, and population fragmentation. The Brackett Creek population of Yellowstone cutthroat trout is typical of most cutthroat populations within the Shields River drainage, in that it is reproductively isolated from other pure populations by the mainstem fish species assemblage of hybridized cutthroat and rainbow trout.



**Table 3.6-1**  
**Sensitive Fish Presence and Habitat**

Sensitive Fish Species	Species Status	Suitable Habitat	Species Present
Arctic grayling	Forest Service Sensitive, ESA Candidate	No	No
Westslope cutthroat trout	Forest Service Sensitive	Yes	No
Yellowstone cutthroat trout	Forest Service Sensitive	Yes	Yes

Source: Forest Service

*Westslope cutthroat trout (Oncorhynchus clarki lewisi)*

Bridger Creek is a tributary to the Gallatin River within the historic range for westslope cutthroat trout, however no pure populations have been found (see Table 3.6-1). Pure cutthroat populations have been defined as less than 10 percent hybridization with other trout species, mainly rainbow. Westslope cutthroat trout historically inhabited the upper Missouri River drainage. The current distribution of genetically pure westslope cutthroat trout in the state of Montana is estimated to be less than 2.5 percent of their historic range. Only three genetically pure and several hybridized populations of westslope cutthroat trout are known to be present on the GNF within the Gallatin and Madison River drainages.

*Arctic grayling (Thymallus arcticus)*

Fluvial Arctic grayling historically inhabited the upper Missouri River drainage. There is no documented presence of Arctic grayling in the Bridger Creek drainage (see Table 3.6-1). An attempt has been made to reintroduce fluvial Arctic grayling into the Gallatin River over the past several years. The success of this effort is not known at this time. The Arctic grayling was recently listed as a candidate for federal listing by the USFWS (67 FR 40657-40679).

### 3.7 ROADLESS

The Forest Plan has established forest-wide multiple use goals, objectives, and management area requirements, as well as management area prescriptions. The analysis of roadless lands documented in Appendix C of the FEIS for the Forest Plan describes each roadless area, the resources and values considered, the range of alternative land uses studied, and the effects of management under each alternative. As a result of the analysis, some roadless areas were recommended for inclusion in the National Wilderness Preservation System and others were assigned various non-wilderness prescriptions. The Inventoried Roadless Area (IRA) within and adjacent to the proposed Study Area is designated MA 2 and MA 12. MA 2 consists of those portions of Bridger Bowl under SUP, including ski trails, chairlifts, as well as areas that exhibit potential for development or expansion of facilities to meet the increasing demand for downhill skiing. The Bridger IRA does not include any portion of the current Bridger Bowl SUP. MA 12 provides habitat for summer or winter wildlife use in a variety of terrain and vegetative types. These areas also offer dispersed recreation opportunities.

#### 3.7.1 AREA OF ANALYSIS

The Bridger IRA comprises most of the higher elevation lands in the Bridger Mountains. The Study Area for this project covers about 101 acres of IRA, which is limited to the Slushman drainage to the south of the existing SUP area (see Figure 2-4).

##### *History and Description*

A portion of the Bridger Bowl SUP area (about 292 acres) was within the original Bridger IRA, including lands along the ridge in the western portions of Sections 24 and 25, T1N, R6E. In conjunction with the analysis for Bridger Bowl's MDP update and SUP renewal, the Bridger IRA boundary was validated as directed by Regional policy. The IRA boundary line was adjusted in Sections 25 and 36, T1N, R6E, to exclude the harvest activity that occurred in the Slushman drainage in the late 1980s. This sale was conducted in 1982, before the IRA boundary line was developed. Continuing north, the IRA boundary line was moved onto the ridge in Sections 24 and 25. This natural feature is easily located on the map and in the field. The line was identified as 50 feet west of the ridge crest.

Bridger Roadless Area #1543 was originally defined on a map at a scale of one inch to two miles, as prepared for the Forest Plan. Boundaries are a generalized line at this scale and cannot be identified with specific features on the ground. The Northern Region Office (Forest Service Memo 9/20/96) directed each Forest to validate the existing IRAs, as displayed on the Forest Plan maps, and generate the current IRA on a 1:24,000 topographic map (i.e., a typical US Geologic Survey quad sheet). The memo also directed Forests to adjust the current boundary according to the procedure and protocol included in the memo. This protocol deals only with the validation of the inventory of existing roadless areas in the Forest Plan. It does not address the evaluation of these areas for future wilderness designation.

When the Bridger IRA boundary was established, approximately 485 acres of land in Section 13, T1N, R6E, was privately owned. In 1993, the Forest Service acquired this parcel, which became part of the NFS land base. Following the direction for updating and monitoring IRA boundaries,

it was determined that this parcel does not fit the criteria for inclusion in an IRA (Forest Service 1996). Therefore, the IRA boundary line continues north along the ridge in Sections 14 and 11 to Ross Pass.

With the adjustment of the Bridger Bowl SUP western boundary and reduction of SUP area in 2002, approximately 100 acres of SUP area was removed from the IRA in Sections 24 and 25, T1N, R6E. The Bridger Bowl SUP was adjusted along the western border so that its boundary was the same as the IRA boundary (Forest Service, 2002). Existing facilities along the ridge crest and outside of the IRA include buildings and a surface tow. In addition, ridge skiing occurs in this area and is a feature unique to the skiing opportunities offered by Bridger Bowl.

Backcountry skiers currently utilize the Slushman drainage within the Bridger IRA. Some skiers access the area from within the Bridger Bowl SUP boundaries and ski through the closed SUP boundary and into the IRA. Other skiers climb up the mountain through private lands surrounding the base area. It is also possible to obtain access through NFS lands; the most common areas are Brackett and Middle Cottonwood drainages.

### 3.7.2 WILDERNESS CHARACTERISTICS

The Bridger IRA was analyzed for its wilderness qualities in the Forest Plan. The wilderness attributes for this area were generally described as low when compared with other roadless areas on the Forest. No public comments were received expressing a desire for the Bridger Range to become wilderness during the Forest Plan comment period. The Record of Decision did not recommend the Bridger IRA for wilderness inclusion. The wilderness option will be considered again when the Forest Plan is revised, but it is currently beyond the scope of analysis for this Proposed Action. The extent of wilderness characteristics displayed within the Bridger IRA is described below:

#### *Natural Integrity and Apparent Naturalness*

The natural integrity of the IRA within the Study Area has been affected along the eastern boundary. An electronics site is located on the ridge, as are existing Bridger Bowl facilities, including buildings and a surface tow.

The natural appearance of the roadless area is impeded by the lack of topographic screening. The narrowness of the area permits views of residential developments on adjacent valley lands. The Bridger Bowl ski area is apparent from the ridge. Clearcut timber units are visible in the lower elevation areas outside of the roadless area, as are harvest units across the canyon in the Bangtail Mountain range.

#### *Remoteness and Solitude*

The area along the ridge is a popular viewing site for raptors during their annual fall migration from late August through early November. The ridge is accessed by walking up through the Bridger Bowl ski area. Other popular accesses to the ridge are the “M” trail route or via Truman Gulch or Ross Peak routes to the north. Three to five trips are required to the electronic site for maintenance each year. The usual mode of transportation to the electronic site for maintenance is by helicopter.

During the ski season, Bridger Bowl patrols the ridge area within the SUP for avalanche hazards and there is often considerable noise associated with avalanche hazard reduction. Ridge skiing and snowboarding inside the IRA boundary occurs daily throughout the ski season. Signs of human activity and encounters with other users are likely throughout the year.

Primitive recreation opportunities are impaired by the narrowness of the IRA. Some activities, particularly winter uses, pose significant challenge and risk due primarily to the high avalanche hazard.

### *Special Features*

The largest known concentration of migrating golden eagles in the lower 48 states fly south along the Bridger Range in their annual fall migration. Golden eagles and several other species of raptors fly over the Bridger IRA during migration.

### *Manageability and Boundaries*

The long narrow shape of the IRA limits the opportunity for enjoyment of wilderness values because human activities adjacent to the roadless area and activities within the roadless area are evident to the users. Development is occurring on private land on both sides of the Bridger Range, which adds to the evidence of human activities nearby. The eastern boundary of the IRA has been moved 50 feet west of the ridge crest, which is a readily defined topographic feature. The roadless area boundary within the Study Area to the south follows the Slushman drainage.



### 3.8 AIR QUALITY

Congress passed the Clean Air Act (CAA) in 1963, and it has been amended in 1972, 1977, and 1990. The purpose of the CAA is to protect and enhance air quality while ensuring the protection of public health and welfare. The CAA established National Ambient Air Quality Standards (NAAQS), which must be met by state and federal agencies as well as private industry. States are given primary responsibility for air quality management. Section 110 of the CAA requires each state to develop a State Implementation Plan (SIP), which identifies how the state will attain and maintain NAAQS.

In Montana, many of the federal and state ambient air quality standards are similar for criteria pollutants. The SIP is promulgated through the Montana Clean Air Act (MCAA) and implementing regulations. The regulations provide specific guidance for maintenance of air quality, including restrictions on open burning (ARM 16.8.1300). The MCAA created the Montana Air Quality Bureau (MQAB) [now managed under Montana Department of Environmental Quality (MDEQ)] and gave it the regulatory authority to implement and enforce the codified regulations. Table 3.8-1 outlines federal and state air quality parameters.

**Table 3.8-1  
Montana State Air Quality Parameters**

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)
Carbon Monoxide (CO)	Hourly Average	35 ppm	23 ppm
	8 – Hour Average	9 ppm	9 ppm
Fluoride in Forage	Monthly Average	-	50 µg/g
	Grazing Season	-	35 µg/g
Hydrogen Sulfide (H <sub>2</sub> S)	Hourly Average	-	0.05 ppm
Lead (Pb)	90 – Day Average	-	1.5 µg/m <sup>3</sup>
	Quarterly Average	1.5 µg/m <sup>3</sup>	-
Nitrogen Dioxide (NO <sub>2</sub> )	Hourly Average	-	0.30 ppm
	Annual Average	0.053 ppm	0.05 ppm
Ozone (O <sub>3</sub> )	Hourly Average	0.12 ppm	10 ppm
	8 – Hour Average	0.08 ppm	- -
PM <sub>10</sub>	24 – Hour Average	150 µg/m <sup>3</sup>	150 µg/m <sup>3</sup>
	Annual Average	50 µg/m <sup>3</sup>	50 µg/m <sup>3</sup>
PM <sub>2.5</sub>	24 – Hour Average	65 µg/m <sup>3</sup>	-
	Annual Average	15 µg/m <sup>3</sup>	-
Settleable Particulate	30 – Day Average	-	10 g/m <sup>2</sup>
Sulfur Dioxide (SO <sub>2</sub> )	Hourly Average	-	0.50 ppm
	3 – Hour Average	0.50 ppm	-
	24 – Hour Average	0.14 ppm	0.10 ppm

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)
	Annual Average	0.03 ppm	0.02 ppm
Visibility	Annual Average	-	3 x 10 <sup>-5</sup> /m

Source: Montana DEQ

The NAAQS are for the six criteria pollutants: carbon monoxide, nitrogen oxide, ozone, sulfur dioxide, lead, and particulate matter. There are numerous types of pollution that could be controlled, but particulate matter is the primary pollutant of concern at Bridger Bowl. The NAAQS require that concentrations of PM<sub>10</sub> do not exceed a 24 hour average of 150 µg/m<sup>3</sup> (micrograms per cubic meter) of air. Average annual arithmetic concentrations are not to exceed 50 micrograms per cubic meter of air.

The August 1977 CAA amendments designated areas of the nation into PSD (Prevention of Signification Deterioration) classes. Class I airsheds are given the most protection from human caused air pollution in order to protect their pristine character. The nearest Class I area is Yellowstone National Park, which is 55 miles to the south. Class II airsheds allow for a greater amount of human caused pollution; Bridger Bowl is a Class II airshed. At this point, the EPA has not identified any Class III airsheds.

Air quality within the Bridger Range and at Bridger Bowl has consistent wind dispersion and very limited local pollution sources (Story, Pers. Comm., 2003). Existing sources of emissions at Bridger Bowl include construction equipment, vehicles, road dust, residential wood burning, and smoke from logging slash disposal. Emissions are very limited with no local visible sources of impairment. Wind dispersion throughout the entire ski area is robust, with no persistent inversions or localized concentrations of emissions (Story, Pers. Comm., 2003). Bridger Bowl is within Montana airshed 8A Gallatin (MDSL, 1988). The entire Bridger Bowl SUP area is considered to be in attainment by the MDEQ. The nearest non-attainment area is Butte for PM<sub>10</sub> (73 miles to the west).

No specific information is available concerning existing air quality at Bridger Bowl. Three stationary sources of air pollution on the Montana Air Quality Division inventory with emissions greater than 100 tons/year occur within 60 miles of the Bridger Range. The Louisiana Pacific lumber mill at Belgrade (10 miles west) is permitted for annual totals of 85 tons/year of total suspended particulates (TSP), 74 tons/year of Volatile Organic Compounds (VOCs), 1 ton/year of SO<sub>2</sub>, and 10 tons/year of NO<sub>2</sub> for a total of 170 tons/year (MDEQ emissions database, 1996). The Holman, Inc. cement plant at Trident (25 miles northwest) is listed as emitting 525 tons/year of TSP, 2,040 tons/year of SO<sub>2</sub>, 484 tons/year of NO<sub>2</sub> for a total of 3,049 tons/year of total emissions. The Luzenac America Talc Plant at Three Forks (31 miles west) is listed as emitting 62 tons/year of TSP, 4 tons/year of SO<sub>2</sub>, 41 tons/year of NO<sub>2</sub>, and 3 tons/year of VOCs for a total of 110 tons/year of total emissions. The emissions from these sources are predominantly dispersed to the northeast with no visible effects within the Bridger Range (Story, Pers. Comm., 2003). No other sources of industrial emissions occur in the analysis area other than very small local sources.

The major source of emissions in the Gallatin Valley is the city of Bozeman, which is a source of vehicle exhaust, wood burning smoke, and road dust. Bozeman emissions visibly do not impact Bridger Bowl as a result of predominant wind direction (Story, Pers. Comm., 2003). Bozeman emissions generally disperse to the east during daylight hours and to the northwest by down valley breezes during nighttime. The main concentration of Bozeman emissions observable during winter inversions is along the East Gallatin River between Bozeman and Belgrade. Particulate monitoring equipment operated by the MDEQ has consistently indicated compliance of Bozeman air quality with NAAQS (MAQB, 1991). Other types of emissions in the Gallatin Valley include vehicle and agriculture equipment exhaust, road dust, wood smoke from residential areas, smoke from pile burning, broadcast burning, and wildfires. Although the Bridger, Gallatin, and Madison Ranges have had a low frequency of wildfires during the last 20 years, wildfire smoke accumulated within the area during periods of extensive regional wildfire activity in 1988 and 1994. The primary sources of wildfire emissions are from central and southern Idaho and southwest Montana. Smoke can also impact the Bridger Range from wildfires in Yellowstone National Park as occurred in 1988 and 1994. The Boswick fire in 1991 impacted Bridger Bowl with heavy smoke over the ridge and several small spot fires.

The MDEQ has estimated that for southwest Montana, including the Bridger Range, a NO<sub>2</sub> background of 6 µg/m<sup>3</sup> (annual average) and 1 hour NO<sub>2</sub> maximum of 75 µg/m<sup>3</sup> are appropriate. These estimates can be improved and localized when more data is available. An average annual PM<sub>10</sub> background concentration, for the purpose of emission concentration screening modeling, can be assumed to be about 8µg/m<sup>3</sup> (MDEQ, 2002).

The valley locations of Bridger Bowl, primarily the lands in the base area, have some potential for cumulative concentrations of smoke and urban, industrial, and transportation emissions, but visible inversion conditions do not occur. Up valley winds during daytime and down valley wind (cold air drainage) at night can dominate valley winds more than overall prevailing wind direction on ridgetops.

Generally, drainages in the Bridger Range do not develop temperature inversions that trap smoke and reduce smoke dispersal. Dispersion of emissions within the Bridger Range is very high due to the mountainous terrain and high wind activity. The Wind Energy Resource Atlas of the United States (Elliott et al., 1986) shows the Bridger Range as an area of high wind energy.

### **3.9 CULTURAL RESOURCES**

Protection of significant prehistoric and historic resources is prescribed in a number of laws, including the Antiquities Act of 1906, the Historic Preservation Act of 1966 (as amended), and the Archaeological Resource Protection Act of 1979. Implementing regulations are codified in 36 CFR parts 60 and 800. Forest Plan standards and guidelines are designed to comply with these regulations, which are found on p. II-17 of the Forest Plan.

The Bridger Mountains have been used prehistorically since post-glacial times. Archaeological surveys have revealed patterned use of the Bridgers, as indicated by successive archaeological complexes, with the prominent use appearing to be during the Middle Period (circa 6,000-1,500 years ago). Flathead Pass was a prominent Native American trail, noted in the Lewis and Clark journals. Historical uses in the proposed Study Area are not as intense as other adjacent areas. Evidence of the expected historical uses can be found across the Bridger landscape. Early ranching operations are evidenced by livestock driveways, cairns and developments such as springs and mine shacks. Mining was not prominent in this area, but evidence of coal operations can be found scattered throughout several drainages.

The Study Area specific to this proposal revealed no evidence of prehistoric or historic activities. This fits the expectations of the Region 1 Programmatic Memorandum of Agreement/Gallatin Site Inventory Strategy, which deemed the specific Study Area as low in potential.



## 3.10 RECREATION

### 3.10.1 INTRODUCTION

The study area for general recreation is within the greater Bozeman community, the GNF, and the State of Montana. The study area for alpine skiing includes the local and regional markets for Bridger Bowl.

Substantial terrain, quality snow, favorable weather, the population and colorful history of the town of Bozeman and its proximity to Bridger Bowl have served to sustain and grow the ski area into a successful local and regional winter resort. Skier visits have averaged approximately 155,350 per year over the past fifteen seasons for which there is data (1988/89 through 2002/03). The current mix of visitors to Bridger Bowl is approximately 65 percent local, 10 percent from other locales in the state of Montana, and 25 percent out-of-state.

The goal for the GNF is to provide a broad spectrum of recreation opportunities in a variety of Forest settings by recognizing and managing the high quality recreational, vegetative, and wildlife resources found on the GNF (USDA, 1987, p. II-1). Forest-wide standards and guidelines for recreation on the GNF include:

- The private sector would be encouraged to provide facilities and services on private land where needed to serve the public.
- Expansion of Bridger Bowl, Big Sky, and the potential development of Ski Yellowstone ski areas would be given priority before any new proposals for downhill ski areas are approved.

Bridger Bowl lies within MA 2, which is designated and managed for developed winter recreation. The area has potential for development or expansion of facilities to meet the increasing demand for downhill skiing. Recreation Opportunity Spectrum (ROS) categories assigned to Bridger Bowl are *Rural* and *Urban*.

The proposed SUP expansion areas (Slushman Creek and SF Brackett Creek) lie within MAs 2, 11, and 12; these areas are classified within the ROS as all classes but *Primitive*, incorporating a variety of recreation experiences. Other recreation standards applicable to the proposed SUP expansion areas include:

#### *General Recreation in the Bridger Mountains*

The Bridger Mountains provide diverse recreation opportunities. There are a variety of other activities in both developed and dispersed recreation settings for the summer and the winter. There has been considerable growth and variability in recreation use on the GNF from year to year over the past decade. A complete summary of total recreation use by activity type on the District for these years is provided in the project file.

The Gallatin Valley provides access to NFS lands, with as many as ten trailheads in the Bridger Mountains alone. As people drive along Bridger Canyon Road (BCR) from the town of Bozeman, Bridger Bowl provides the first public access in the canyon to NFS lands. This special

use permit holder is a local business with strong ties to the community that provides developed winter recreation opportunities to the public on NFS lands.

The town of Bozeman manages fifteen parks for public recreation, which encompass two summer swimming pools, two tennis courts, two basketball courts, and two winter skating rinks. There are also six golf courses in the vicinity of Bozeman. Other private recreation opportunities include bowling alleys, spas and pools associated with local motels, as well as outfitters that provide horseback riding and guided fishing and hunting trips on NFS lands.

### 3.10.2 DEVELOPED WINTER RECREATION

#### *Alpine Skiing*<sup>2</sup>

Bridger Bowl, Inc. is a locally owned and operated non-profit organization whose mission is to “plan, develop, and maintain facilities and services ... [to] provide the best possible skiing experience at a reasonable cost” (MDP 2002). The “best possible ski experience” is defined as uncrowded runs, minimal lift lines, and a variety of slope types based on ski area focus groups conducted over the past several years by Bridger Bowl. Ski area bylaws demonstrate that the area is committed to providing affordable and outstanding skiing, “to the residents of Gallatin County, ... the citizens of Montana, and ... to areas outside Montana” (bylaws, revised 1999).

At just more than 15 miles from the town of Bozeman, Bridger Bowl has strong local support. It offers the character and feel of a local resort that accommodates the needs of the community. As part of on-going operations, Bridger Bowl provides ski instruction to students from the surrounding 56 different public schools at reduced prices. The program has grown over the past 10 years from approximately 3,900 in 1992-1993 students to 4,100 students in 2002-2003. Additionally, adult ski school lessons have grown from 100 to 1,261 lessons over the same period.

The Eagle Mount program provides ski instruction for persons with physical and developmental disabilities. In the 2001/02 and 2002/03 seasons, Eagle Mount provided over 700 lessons for program participants at Bridger Bowl. The program shares a facility with the ski patrol in the base area and assists all disabled skiers, not just those who participate in lessons.

#### *Lifts*

Seven chairlifts serve the ski area guests including one quad, two triples, and four doubles. Additionally, one surface lift accesses the ridge; this lift is for ski patrol personnel and is not open to the public. Two thousand vertical feet are lift served; the remaining 600 feet are accessible only by foot.

Currently, the Alpine chairlift is of an aging design that contributes to loading and unloading difficulties, with line swing and bounce that require the lift be run below design capacity.

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<sup>2</sup> At ski areas, one may see people using Alpine, snowboard, telemark, cross-country, and other specialized ski equipment, such as that used by disabled or other skiers. Accordingly, the terms “ski, skier, and skiing” in this document encompass all lift-served sliding sports typically associated with a winter sports resort.

Additionally, the steepness of the terrain at the upper portions of the terrain served by this lift causes difficulty for lower ability level skiers.

The Bridger chairlift is a fixed grip double that was built in 1964 with an hourly capacity of 875 skiers. The lift was updated with a new top drive terminal and haul rope in 1995. However, the capacity of this lift is lower than the capacity of the terrain in this area.

The Deer Park chairlift is a double chair with a hourly capacity of 1,100 skiers. The upper terminal is in need of repairs and the expert level terrain near the top of the lift is hard for lower ability skiers to navigate. In addition, the existing lift has an outdated bottom tension terminal that is disproportionately large and extends into the circulation path for skiers going between the Deer Park Chalet and Pierre's Knob contributing to an already congested area.

The bottom terminal of the Virginia City chairlift is a fixed grip double lift located on private lands with an hourly capacity of 1,200 skiers. The existing bottom tension terminal is located adjacent to the day lodge and contributes to base area congestion on the south side of the day lodge.

### *Trails*

Flanked by two large bowls to the north and south, Bridger Bowl offers a variety of downhill skiing terrain. The terrain is comprised of approximately 1,500 skiable acres on NFS and private lands, with a base elevation of 6,100 feet and a vertical rise of 2,600 feet. Developed ski terrain is comprised of 69 named trails on approximately 407.1 acres of developed ski terrain. Much of the ski area consists of informal networks of openings in trees, rock bands, and cliffs. The developed lift and trail network supports a capacity of 3,200 skiers and accommodates a range of skier abilities from beginner to expert.

Table 3.10-1 illustrates the distribution of existing developed ski terrain by skier ability level. The table shows Bridger Bowl to have fairly well balanced distribution of terrain compared to the ability levels in the market. However, the market demand for low intermediate, intermediate, and advanced terrain is not met by the current distribution of lift capacity; as a result, these skiers are using the available novice terrain. Use of these novice areas by skiers of higher ability levels results in congestion in these areas as well as the potential for skier safety conflicts. Additional intermediate and advanced terrain is needed.

**Table 3.10-1**  
**Bridger Bowl Existing Terrain Distribution by Ability Level**

	Skier/Rider Market Demand <sup>a</sup> (percent)	Skier/ Bridger Bowl Distribution (percent)	Normalized Terrain Distribution <sup>b</sup> (percent)
Beginner	5	1	2
Novice	15	43	15
Low Intermediate	25	17	25
Intermediate	35	25	37
Advanced Intermediate	15	8	12
Expert	5	6	9

<sup>a</sup> Skier/Rider Market Demand is the theoretic percentage distribution of skiers by their ability level.

<sup>b</sup> Normalized Distribution is the percentage distribution of existing Bridger Bowl lift and terrain capacity. This column should be used in discussions regarding the distribution of terrain by ability level. This is also a function of the mountain shape, which is steeper near the ridge and less steep as one travels down the face of the mountain.

### *Ski Area Capacity*

Ski area capacity is primarily a function of lift and ski terrain capacity. Capacity is calculated in terms of Skiers at One Time (SAOT) or Comfortable Carrying Capacity (CCC)<sup>3</sup>. The 2002 MDP proposal calculates the current SAOT of the ski area at 3,200. This is based on the National Ski Areas Association methodology as described in *Ski Area Management* magazine (November, 2001). This particular model combines the basic SAOT capacity modeling with lift ride times and skier speed. The assumptions of the Bridger Bowl SAOT calculations and the Comfortable carrying capacity model run for this proposal were compared to determine the current CCC. The comparison indicates that some lift line times and slope lengths varied, however, for the purposes of the analysis in this SDEIS a CCC of 3,200 is used.

Since the SAOT capacities in the 2002 MDP have now been rectified with the CCC calculations in this SDEIS, SAOT and CCC are used synonymously for the remainder of this document. The CCC model has been developed to complete more detailed analysis of ski area capacities including variability in lift line times, skier speeds, and the density of skiers per acre on various slopes. CCC is also used to balance skier service needs (parking, food service, restrooms, etc) with mountain capacity. CCC represents the theoretic level of skier and operation satisfaction and a quality recreation experience on NFS lands.

The number of skiers on a particular trail is controlled by the capacity of the lift and the speed of the skier. The calculated skier density within each “pod” of ski trails is shown below. These calculations are based on a day at a CCC of 3,200 and a peak day of 4,000 skiers, with all lifts operating. Bridger Bowl conducts counts of lift riders and lift lines at regular intervals and has data from these counts over the last 10 years. Lift lines vary considerably during heavy snow

<sup>3</sup> Comfortable Carrying Capacity (CCC) is defined as the maximum level of utilization of a ski area (the total number of skiers that can be accommodated at any given time) that guarantees a pleasant recreational experience while at the same time preserving the quality of the environment.



period or holiday periods, depending on time of day, lifts and slopes open and general skier ability levels.

Table 3.10-2 illustrates the calculated existing condition for lift lines showing a “typical” distribution of lift lines. The table also shows the density of skiers in a given lift “pod,” with skier densities less than the typical desired condition. This desired condition is based on calculations for skier densities at resorts across western North America. It is also a function of the area of a ski trail assigned to each lift and the ability level of the ski trails assigned.

**Table 3.10-2  
Existing and Desired Skier Density on a day with 3,200 Skiers**

<b>Lift</b>	<b>Ride time (minutes)</b>	<b>Line Wait Time (minutes)</b>	<b>Persons in Line</b>	<b>Skier Density on Trail</b>	<b>Desired Trail Density</b>	<b>Difference (+/-)</b>
Snowflake	1.14	2	27	29	29	0
Virginia City	7.79	2	20	9	12	-3
Powder Park	8.38	2	27	8	12	-4
Bridger	8.01	6	83	1	3	-2
Deer Park	5.89	4	70	2	6	-4
Pierre’s Knob	9.03	8	190	2	6	-4
Alpine	8.30	6	105	2	8	-6

Source: SE Group and Bridger Bowl

For every lift, Bridger Bowl’s skier density is lower than the desired condition, which indicates un-crowded skiing conditions. In the Snowflake beginner area, current skier density equals or exceeds the desired density. This condition is normal and does not reflect the actual conditions during ski school operations. When ski school is operation, students are grouped together and may be stopped on the slope for instruction, which accounts for a lower density of skiers actually skiing on beginner slopes.

Skier densities below the desired condition indicate that the slopes are less crowded than the “typical” condition which includes large destination resorts (such as Vail, CO; Keystone, CO; and Park City, UT). The skier densities below desired conditions at Bridger Bowl likely reflect the local attitude toward “crowded” conditions. The ski slopes are currently perceived as crowded during peak periods of holidays and heavy snow. Individual lift lines can approach 30 minutes for certain periods when upper mountain lifts are closed due to potential avalanche conditions.

For several years, Bridger Bowl has conducted skier focus groups. In addition, Bridger Bowl commissioned a survey by mail in 1999. The survey resulted in 635 responses of which 192 were Bridger Bowl Association members. In summary, the 1999 survey concluded that skier services, including cafeteria functions, and parking were the greatest concern. For mountain facilities, 78 percent of the respondents wanted changes to the lifts, and 40 percent requesting changes to terrain. Continuing focus groups have added definition to the survey data. These groups have helped define the desired skiing experience, which is identified as an experience

with “less crowded” skiing - uncrowded runs and minimal lift lines - and a variety of slopes. The focus groups also addressed their desires for expansion to the Slushman area (south) and Bradley Meadows (north).

### *Skier Support Services*

Skier support services include food service, restrooms, ticket sales, ski school, ski patrol, ski area administration, child care, ski rental, and retail areas. Most Bridger Bowl skier services are located in the base area on private lands. The Jim Bridger Lodge is approximately 19,820 square feet; it was remodeled in 1987. The original Deer Park Chalet was replaced with a more modern facility in 1997; this building is approximately 14,325 square feet. The new ski patrol building was completed in 2002. It offers improved facilities for the ski patrol and includes additional space for the Bridger Ski Foundation as well as the Eagle Mount program. A new day lodge is currently under construction on the site of the old ski patrol facility. The new day lodge will be compliant with the Americans with Disabilities Act (ADA) and provide expanded skier services, consolidate administrative offices, provide more ticket windows and rental space, including specialized rental space for the school programs. Construction on the new day lodge started in 2003 and is anticipated to be complete for the 2004/05 season.

### *Skier Demographics*

The local day skier market area for Bridger Bowl generally encompasses the area within a two-hour or 100-mile driving radius, which comprises a population base of approximately 115,400.<sup>4</sup> As stated previously, approximately 65 percent of the Bridger Bowl skiers come from the local market area (primarily Bozeman and Livingston), while 10 percent are other Montanans, and 25 percent are from out-of-state. A primarily local clientele is associated with busy weekend and holiday periods, while the ski area is underutilized during the week. This makes for inefficient and expensive operation of the ski area during the week as well as crowded facilities on the weekends and holidays.

### *Skier Visitation*

As shown in Table 3.10-3, growth in Montana skier visitation over the past ten years has exceeded the growth witnessed on a national basis. Recent record use levels are due in part to aggressive advertising efforts by the State Travel and Promotion Division, local and regional growth in population and expanded alpine skiing operations (at Big Mountain, Big Sky, and Red Lodge), which attract greater numbers of out-of-state skiers.

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<sup>4</sup> Includes Park, Gallatin, Madison, Sweet Grass, Jefferson, Broadwater, Wheatland, and Meager counties. Montana Department of Commerce, *CEIS: Montana Population Projections*, February 1998.

**Table 3.10-3  
Skier Visit Trends (1000s)**

<b>Season</b>	<b>United States Skier Visits</b>	<b>Montana Skier Visits</b>	<b>Bridger Bowl Skier Visits (5 year average)</b>	<b>Bridger Bowl Skier Visits (actual)</b>
1992/93	54,000	966	135	145
1993/94	54,600	989	143	174
1994/95	52,500	1,063	152	193
1995/96	53,983	1,141	161	151
1996/97	52,520	1,186	167	173
1997/98	54,100	1,027	167	143
1998/99	52,100	1,058	167	174
1999/2000	52,200	1,169	163	172
2000/01	57,300	1,151	164	158
2001/02	54,400	1,199	166	185
2002/03	57,600	1,084	167	146
<b>Percent Change over Time</b>	<b>6.7%</b>	<b>12.2%</b>	<b>23.9%</b>	

Source: NSAA, Forest Service, Ski Area Operators, SE Group, 2002/03 Kottke National End of Season Survey.

Many factors that are beyond control affect annual skier visitation; the most notable is weather and snowfall patterns. In Table 3.10-3, the numbers for running average compared to the actual skier visits for Bridger Bowl demonstrate this. As a result, the running average Bridger Bowl skier visits reflects an approximately 23% change over the 10-year period.

Weighted averages are used to measure skier visit trends to reduce the influence of year-to-year snowfall amount and timing. National and Montana skier visits are compilations of all reporting areas within these geographic locations. This compilation factors out weather influences; some areas will have good snow while others may have too much or too little snow during critical periods. Skier visits at Bridger Bowl, as measured in weighted averages over the past five years, appear to remain approximately the same. However, as shown in Table 3.10-3, skier visits varied over several consecutive seasons from 158,000 in 2000/01 to 185,000 in 2001/02 and back to 146,000 in 2002/03 due to snow and weather conditions. The 185,000 actual skier visits in 2001/02 was the second highest recorded after the 1994/95 season, during which Bridger Bowl had 195,000 visits.

An analysis of the peak day size changes over the past 20 years indicates that the size of the peak day has decreased from the highest days in 1993/94 (4,525 skiers), 1995/96 (4,311 skiers), and 1997/98 (4,393 skiers); to the 1999/2000 season of 3,607 skiers and 3209 skiers in 2000/01 season. Throughout the late 1980s and early 1990s Bridger Bowl saw increases in the peak day skier visits. These peak days occurred primarily during the Christmas holiday season, which was

then the peak revenue generation time for the resort. In 1989, skier visits during the Christmas week began to exceed the CCC of the resort.

In 1995/96, the size of the peak Christmas week visitation began to decline, and has not recovered. This is likely due to skier dissatisfaction as represented in the focus group information, local skiers recognizing a busy period and choosing not to ski during the period and the increase in capacity at Big Sky, Red Lodge and Big Mountain, all of whom compete with Bridger Bowl for the holiday market.

During the same time frame (1993 to present), Bridger Bowl has seen peak days due to heavy snowfall (i.e., “powder days”) increase. The 1992/93 ski season marked the shift in skier behavior as skier visits in heavy snowfall (greater than 6 inches overnight) increased dramatically. Prior to 1993, the average peak snowfall skier visits were 1,835 visits per day. After 1993, average peak snowfall skier visits increased to 3,030 skiers, an increase of 65 percent in peak powder day skier visits. In 1992/93, peak snowfall skier visits exceeded CCC for the first time. This has occurred at least once during five separate seasons since that season, including the last two years, during which peak snowfall visits were 3,378 in 2001/02 and 3,456 in 2002/03.

Peak snowfall days often present additional challenges for Bridger Bowl. Holiday and weekend skier use is generally spread across all seven lifts. Peak snowfall days see a greater proportion of skiers accessing the steeper terrain of the four upper mountain lifts. This tends to increase lift lines on these four lifts, and increases skier densities on the slopes. All four lifts and the associated ski terrain are protected through avalanche hazard reduction activities by Bridger Bowl ski patrol. Due to the need for avalanche hazard reduction, these lifts may be slow to open or may remain closed on the largest heavy snow days when hazard reduction requires more time.

In the most difficult conditions, heavy snows or poor visibility may require that only terrain that does not require avalanche hazard reduction can be opened. In the current lift and trail organization, Pierre’s Knob lift is the only upper mountain lift that can be opened. These days see lift lines in excess of 20 minutes as peak snowfall crowds are forced to the Pierre’s Knob lift for access to skiing. This exceedingly long lift line time can occur even if the ski area is not at capacity.

### *Market Share and Competition*

Market and functional analyses were undertaken as part of the Bridger Bowl master planning process. Key findings from these analyses and information updates are included in this document. A copy of the Bridger Bowl Master Plan (February, 2002) is located in the project file and is available for review at the Bozeman Ranger District. Some of the findings of the analyses are summarized below.

Review and analysis of relevant national data indicate that there is an ever-increasing level of customer awareness of quality, service, and value in the ski experience. Progressive ski areas and resorts have catered to the changing demands of the skier population by providing convenient air access, quality accommodations, a heightened service orientation, a more refined, and technologically improved ski experience, and numerous year-round recreational amenities.

Ski areas that have invested in faster and more comfortable ski lifts, snowmaking, terrain expansion, increased trail grooming, and other quality improvements have created higher quality skiing, and they have typically captured additional market share.

These developments have also led to an overall improvement of standards and a higher level of expectation among the skiing public. Conversely, stagnation (i.e., lack of improvements or failure to maintain standards consistent with visitor expectations) has led to the erosion of market share and eventually a decline in skier visit performance. Stagnation is largely responsible for the 25 percent reduction in the number of ski areas nationwide over the past 13 years. The closure of Montana ski areas, including Beef Trail, Deep Creek, and Wraith Hill, over this time period has mirrored the national trend.

In order to avoid this stagnation, the Bridger Bowl Board of Directors adopted a new Mission Statement in 1996. Their mission is to plan, develop, and maintain facilities and services in a financially sound manner at Bridger Bowl, which would provide the best possible skiing experience at a reasonable cost to local, regional, and destination skiers. Bridger Bowl has maintained a growth in annual skier visits while the competition has developed and expanded. As shown in Table 3.10-3, stable and increasing annual skier visits are a measure of total use of the ski areas.

Thirteen ski areas operate in Montana, ranging from small, local areas with few lifts and support facilities, to larger destination oriented resorts with national recognition. Big Mountain, Big Sky, and Red Lodge Mountain are Bridger Bowl's primary competitors. Together, all four areas account for more than 68 percent of all skier visits in Montana; this has remained relatively constant over the last decade. Big Sky has experienced the most substantial growth in visitation and has moved from third to the most popular ski area in the state. This growth is largely due to major capital improvements to the ski facility and available lodging. While much of this gain has resulted from increased destination visitors (approximately 60 percent of total visitation), Big Sky has also captured additional skiers from the local and regional markets; Big Sky currently generates 30,000 to 40,000 skier visits from the Bozeman area alone (Big Sky Resort, Ski Area Management, Personal communication, February 1998). To a certain extent, this has been at the expense of the other regional ski areas.

### *Ski Area Utilization*

Another measure of demand in the market place is ski area utilization. Utilization is the relationship between the daily capacity of the ski area (CCC) and actual skier visits, and it is expressed as the percentage of total capacity which is "occupied" by skiers on any given day. In other words, the utilization rate is a measure of the use of a winter recreation area on NFS lands, and it is a measure of the resort efficiency. A low utilization indicates over-capacity of the infrastructure; high utilization indicates an efficiency balance between capacity and skier demand, but can indicate crowding and under capacity, especially at smaller, regional and day ski areas, when skier visits are controlled by weekend and holiday periods or heavy snowfall (NSAA Economic Analysis of United States Ski Areas; RRC Associates, January 2003).

Bridger Bowl has also experienced utilization levels significantly above industry averages over the years, which is indicative of an active skier market and high local demand. On a regional



comparison basis, the Rocky Mountain region experienced a utilization of 35.5 percent for the season 2001- 2002. On a comparable size basis, the national average utilization is 40 percent. As shown in Table 3.10-4, utilizations of 45 percent to 47 percent at Bridger Bowl is very high, particularly for a day and/or weekend oriented ski area.

**Table 3.10-4  
Utilization at Bridger Bowl**

<b>Year</b>	<b>Days Open</b>	<b>Annual Utilization</b>
1997 – 98	112	40%
1998 – 99	115	47%
1999 – 00	115	47%
2000 – 01	122	40%
2001 – 02	122	47%
2002 - 03	102	45%
<b>Average</b>	<b>114</b>	<b>44%</b>

While exceeding a ski area's comfortable capacity on several occasions during a given season is not uncommon, most operators look for expansion opportunities once a ski area consistently surpasses average industry utilization levels, in order to enhance the skiing experience, maintain a competitive edge, and thereby sponsor additional growth in visitation.

#### *Nordic Skiing*

Other than lift-served skiing, Bridger Bowl does not offer any other developed winter recreation activities (i.e., cross country skiing, ice skating, snowtubing). The Bohart Ranch, located approximately one mile north of the ski area, provides a quality Nordic skiing center, offering equipment rentals and sales, lessons, and 25 km of groomed trails. The Nordic trail system is currently located on Bohart Ranch and NFS lands north of the existing Bridger Bowl SUP boundary. Bohart Ranch received approximately 9,600 Nordic visits in 1996/97 and has experienced increasing use each year since opening more than 15 years ago (MacInnes, personal communication, 1998).

### 3.10.3 DISPERSED WINTER RECREATION

#### *Backcountry Skiing*

For years, dispersed backcountry skiing and snowboarding, have occurred on NFS lands in the Bridger range and adjacent to Bridger Bowl. Although Bridger Bowl provides the first access to NFS lands along BCR, access to the adjacent backcountry terrain is not authorized through the existing ski area, due primarily to public safety concerns. The Forest has a long history of concern for public health and safety especially in the Slushman drainage. This area is well known for its avalanche potential. Slushman drainage is immediately adjacent (south) to the ski area and outside of the SUP boundary. Bridger Bowl does not provide patrol or avalanche hazard reduction to any areas outside the SUP boundary.

Both the Forest Service and the ski area have concerns with the number of people skiing out of bounds from higher elevations within the SUP area into the Slushman drainage and Bradley Meadows. The concerns centered on avalanche hazards and difficult search and rescue team

access to these areas. However, the desire to access the ridge above Bridger Bowl, as well as the bowls to the north and south of the permitted ski area, for backcountry skiing has continued to grow.

Visitors have continued to access NFS lands through Bridger Bowl property. This occurs in the early morning and late afternoon, both during and outside of the operating season of the ski area. As a result, snow safety/avalanche hazard reduction activities have been delayed or cancelled due for public safety reasons. When visitors are within the permitted ski area boundary during control periods and the mountain closed to the public, their location cannot be verified prior to a controlled explosion, nor can it be determined if the visitors are located within or adjacent to a potential slide path.

Further safety concerns involve snow grooming operations during the ski area closed hours. Grooming normally occurs during night times and twilight hours. Visibility is limited to areas lit by the grooming vehicle and further reduced in powder snow or during snow storms. Vehicle operators cannot anticipate where visitors will be during closed hours; this creates the potential safety hazard. In 1998, the GNF issued a further order prohibiting uphill travel, except when riding lifts within the SUP boundary, 24 hours per day (Use Restriction Bridger Bowl Ski Area Order Number 98-11-06-02, December 18, 1998).

Bridger Bowl has given an easement to the Forest Service across their private lands for access to NFS lands within the SUP boundary. This access is primarily for administration and management activities. On NFS lands, this road is designated Forest Service Road (FSR) 3200. FSR 3200 also provides summer access to NFS lands near Bridger Bowl. Under the terms of the SUP, the Forest Service retains the right to use or permit others to use any part of the permitted area, including FSR 3200, provided such use does not interfere with the right and privileges authorized by the SUP to Bridger Bowl. Interference can include affecting the safe operation of the permitted facility. The determination of interference is at the Forest Service's discretion. Because the road is used as a groomed ski run in winter, the aforementioned 1998 use restriction order effectively closed FSR 3200 beyond the plowed portion of the road during the operating season of the ski area except to users under permit authorization.

Forest users also access the NFS lands adjacent south and north of the permitted ski area through other private lands near the base area of Bridger Bowl. However, there is no public access across these lands. Private landowners in the area may have allowed access across their lands in the past, but most areas are now closed to access across privately held property. Similar ski terrain is available for backcountry skiing and dispersed recreation use north of Bradley Meadows, including Ross Pass and Saddle Mountain; however, access to these areas is less convenient than it is to those areas adjacent to the Bridger Bowl SUP area.

Recreational snowmobiling is currently prohibited within the Bridger Bowl SUP area, as well as in the Slushman drainage. Due to potential conflicts with Nordic skiers and wildlife, snowmobile use within the South Fork Brackett Creek drainage is discouraged although technically permitted under MA 12. Other dispersed recreation activities that occur throughout the year on public and private property outside the SUP area but within the vicinity including hunting, sledding, hiking/mountain biking, and horseback riding.

### *Summer Recreation at Bridger Bowl*

While no developed recreation activities are offered at Bridger Bowl, the area provides opportunities for a variety of dispersed recreation. FSR 3200 is authorized for summertime use. People often park at the trailhead and hike within and adjacent to the SUP area. Hiking trail #538 traverses the Bridger Bowl permit area from north to south, generally between the elevations of 6,500 and 7,000 feet, crossing numerous existing lift and trail alignments. Summer use of this trail segment has increased over the past few years as it is often accessed by hikers and mountain bikers (Bridger Bowl, personal communication, 1998). Additionally, Bridger Bowl hosts a raptor viewing platform from which up to 17 birds of prey species can be seen during their migration south, between late August and early November. The trail to access the viewing platform extends from the top of the Bridger Lift and traverses near the patrol ridge lift to the ridge. This is one of the few renowned flyaway trails in North America, and it receives frequent use in the summer.

### 3.11 VISUAL RESOURCES

Visual resource management is directed by the Visual Management System<sup>5</sup> and the GNF Forest Plan (Forest Plan). The Visual Management System (VMS) has been used to analyze the visual conditions on National Forest Service lands (NFS) at Bridger Bowl. The VMS helps establish Visual Quality Objectives (VQOs) for various landscapes and helps define how the landscape will be managed, the level of acceptable modification in the area, and under what circumstances modifications may be allowed. VQOs range from Retention to Unacceptable Modification.

The Retention VQO provides for management activities that are not visually evident when compared to the characteristic landscape. Partial Retention indicates that management activities remain visually subordinate to the characteristic landscape. Under the VQO of Modification, management activities may visually dominate the original characteristic landscape, but alterations must borrow from naturally occurring forms, colors, or textures so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area. Maximum Modification is defined as areas where management activities may dominate the characteristic landscape. When viewed as foreground or background, activities may not appear to completely borrow from naturally established form, line, color or texture; however, when viewed as background, the visual characteristics must be those of natural occurrences within the surrounding landscape. Unacceptable Modification exists when the overall extent of management activities is excessive and poorly related to scale of landform and vegetative patterns in characteristic landscape.

Viewing distance is important in determining how change is perceived across a landscape. In addition to VQOs, the VMS also uses distance zones to describe the part of a characteristic landscape that is being inventoried or evaluated. The three distance zones are described below.

*Foreground:* The limit of this zone is based upon distances at which details can be perceived. Normally in foreground views, the individual boughs of trees form texture. The foreground is limited to areas within and not to exceed ½ mile of the observer, but it must be determined on a case-by-case basis, as any distance zoning should be. Generally, detail of landforms and special landscape features (including human alteration) are more pronounced when viewed within the foreground.

*Middle ground:* Alterations in the middle ground (½ to four miles from the observer) become much less distinct. Texture normally is characterized by the masses of trees in stands or uniform tree cover. Individual tree forms are discernable in very open or sparse stands only.

*Background:* As the perspective shifts to the background, distance has a modifying and diluting effect to both landscape texture and color. This zone extends from the middle ground (minimum of four miles between the observer and the area being viewed) to infinity. In very open or sparse timber stands, textures begin to be lost. Shape, however, may remain evident beyond 10 miles, especially if it is inconsistent with other landscape forms. Beyond 10 miles, alteration in landscape character becomes obscured.

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<sup>5</sup> Agriculture Handbook 462

The Forest Plan provides visual resource management and direction for activities that may alter the natural landscape (USDA, 1987, p. II-3). The Forest Plan establishes a range of VQOs for individual Management Areas (MAs) within the GNF (USDA, 1987, p. II-16), and those are further refined by the VQO polygon map. Bridger Bowl's current SUP area is allocated as MA 2. The proposed Slushman expansion area is also designated MA 2. The proposed northern expansion areas into SF Brackett Creek are within MA 12. Although GNF standards do not apply to adjacent private lands, these areas still meet VQOs, which are applied to observers along BCR.

The VQOs assigned to the Bridger Bowl SUP area is Partial Retention on the developed ski slopes (USDA, 1987, p. III-4). The VQO standards for MA 12 range from Retention to Partial Retention (USDA, 1987, p. III-37). The Forest Plan Visual Quality Objective Map (revised July, 1987) indicates that the proposed expansion area to the north is designated Retention on the upper slopes (above Bradley Meadow). As a result, facilities in this area must be harmonious with the landscape for those users within the SUP and observers along BCR.

### *Scope of the Analysis*

The visual resource study area for Bridger Bowl is the ski area as viewed looking west from Bridger Canyon Road (BCR). The critical viewing area analyzed in this SDEIS include areas along BCR from approximately three miles south of the Bridger Bowl access road to two miles north of the access road (see Figure 4-5). The existing ski area can be seen directly from this area. The ski area is seen by highway travelers in both directions, homeowners with westward views, and recreationists along BCR and in the Bangtail Mountains.

The Study Area can be classified into three elevation zones. These areas are considered middleground as viewed from BCR. The upper zone is characterized by the rocky cliff areas extending along the ridge and upper elevations of the ski area. Saddle Mountain and the ski area ridge are the prominent landmarks. The rocky cliff area is characteristic of the entire Bridger Range. Peaks to the north, including Sacajawea Mountain exhibit similar characteristics. The rocky cliff areas are aligned in vertical patterns from the summit to the tree line. Natural vegetation openings caused by snow slides also reflect this vertical pattern.

The middle zone is comprised of a mix of open grassy meadow and closed canopy of spruce and fir trees. The area to the south of the existing SUP is comprised primarily of open meadow with widely scattered individual trees. The openings for developed trails within the existing ski area mimic this pattern. Ski area activities have been part of this setting for over 40 years and are not readily apparent; in fact, they are subordinate to the landscape character. In summer, lift access roads are visible to the stationary observer. The east facing ridge and Bradley Meadows area are characteristic of the mix of openings and tree cover on the northern portions of the study area. The lower zone includes existing base area facilities and parking lots that are not visible from BCR.

The foreground viewing zone, as viewed from BCR includes a mix of tree cover and a few meadow openings, primarily agricultural areas.



### 3.12 SOCIO-ECONOMICS

This section summarizes current socio-economic data relevant to the proposed project, including data on population, housing, local economic activity, and fiscal information pertinent to Bridger Bowl. The City of Bozeman and the surrounding Gallatin Valley area are considered the primary socio-economic impact area.

Bozeman is the Gallatin County seat and the home of Montana State University. Yellowstone National Park and the GNF are located nearby. The city is located along Interstate 90, in a high mountain valley at an elevation of 4,795 feet above sea level, and is the site of several cultural activities and attractions.

Agriculture is the primary industry in Montana, but Gallatin County also has over three thousand business, including science and technology, recreation, tourism, education, and manufacturing. The work force is rated as well-educated, with 49.5 percent of Bozeman's population holding a college degree, and 73.7 percent having participated in some post-secondary education (Gallatin Development Corp., 2000).

#### *Population*

Historic, current, and projected population data for Gallatin County and the City of Bozeman are presented in Table 3.12-1. The county ranks as the fifth highest populace in the state with a population of 64,831 in 2000. Gallatin County has experienced considerable growth in the past decade, with steady growth expected into the next century. Ninety percent of Gallatin County's residents live either in Bozeman or within a thirty-minute drive of the city. The population is very homogenous, with fewer than five percent of residents of non-white ethnicity.

**Table 3.12-1  
County and City Population Figures**

	1990	1995	2000	Projections 2005-2015		
				2005	2010	2015
Gallatin County	50,463	59,578	64,831	69,720	74,310	78,830
Percent change	-	18.1%	8.8%	7.5%	6.6%	6.1%
Bozeman	22,660	27,776	27,509	-	-	-
Percent change	-	22.6%	-1.0%	-	-	-

Sources: US Bureau of the Census, MT Dept. of Health & Human Services, Woods & Poole Economics, Gallatin Development Corp.

#### *Housing*

Characteristics of the housing supply in Bozeman are presented in Table 3.12-2. The City of Bozeman and its surrounding area are primarily year-round residential, with relatively little seasonal or occasional-use housing compared to other ski resort areas. As of 2000, less than two percent of the housing units in the area were designated as seasonal or occasional-use. The overall vacancy rate as of 2000 was only 5.9 percent. These numbers reflect the fact that Bridger

Bowl largely serves the local population as its primary market, with destination visitors accounting for a much smaller share.

**Table 3.12-2  
Housing Supply Characteristics for 2000**

	<b>Bozeman City</b>	<b>Bozeman Suburban Area</b>
Total housing units	11,577	16,283
Occupied owner	6,859	5,780
Occupied renter	6,218	5,940
Vacant	718	966
Seasonal	175	282
Total vacancy rate	6.2%	5.9%
Median value owner occupied	\$137,300	\$151,400
Median contract rent	\$494	\$498

Source: US Bureau of the Census

The average sales prices of single family homes in the Bozeman area have roughly doubled between 1990 and 1997 according to data from the Gallatin Association of Realtors. Average home prices in the city have gone from about \$70,000 to almost \$140,000 in the past ten years, while homes in suburban Bozeman increased from about \$80,000 to around \$150,000. Average sales prices for homes with more than an acre of land in suburban Bozeman have gone from roughly \$130,000 to about \$240,000 in the same time frame.

Annual building permits for construction of new residential homes increased from fifty-eight million dollars of new residential construction in 1998 to over seventy-three million dollars in 2001, peaking at over eighty million dollars in 1999 and 2000. The new construction represents mostly single-family homes, with a smaller number of affordable-housing units and vacation homes mixed in. Table 3.12-3 lists the total number of housing starts and value of building permits from 1998 to 2001.

**Table 3.12-3  
New Housing Starts in Bozeman Jurisdictional Area 1997-2001**

	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
Housing Starts	414	546	415	307
Total Value of Building Permits (in Thousands)	\$58,392	\$83,830	\$81,406	\$73,468

Source: Bozeman City/County Planning Office, Gallatin Development Corp.

### *Employment and Spending*

Throughout the last decade, the labor force (i.e., number of people able to work) and the number of people employed in the Bozeman area has increased steadily. The labor force increased by 23 percent from 1995 through 2001. The local unemployment rate has shown a slight decline during the same period, and has been consistently lower than the state unemployment rate. Table 3.12-4 shows labor force and employment figures for 1995-2001.

**Table 3.12-4**  
**Bozeman Area Labor Force and Unemployment Rate**

<b>Year</b>	<b>Labor Force</b>	<b>Employed</b>	<b>Unemployment Rate</b>	<b>Montana State Unemployment Rate</b>
2001	44,240	43,132	2.5%	4.6%
2000	44,843	43,652	2.7%	5.0%
1999	42,697	41,491	2.8%	5.2%
1998	40,699	39,428	3.1%	5.6%
1997	39,280	38,114	3.0%	5.4%
1996	37,849	36,886	2.5%	5.3%
1995	36,091	35,121	2.7%	5.9%

Source: Montana Department of Labor and Industry, Gallatin Development Corp.

Table 3.12-5 displays the 2001 employment and wage information by major industry group in Gallatin County. The table reflects the diversity of employment characteristics for the county, with 27 percent of the labor force in the retail trade category, 24 percent in services, 21 percent in government, and 9 percent in manufacturing. Montana State University is the single largest employer in the area, with approximately 2,000 people on the payroll.

**Table 3.12-5  
Gallatin County Average Employment Characteristics 2001**

<b>Industry</b>	<b>Employment</b>	<b>Wages</b>	<b>Per Worker</b>
Agriculture, Forestry, Fish*	478	\$7,800,147	\$16,318
Mining*	68	\$1,942,393	\$24,728
Construction	2,863	\$79,700,194	\$27,838
Manufacturing (including Technology)	2,763	\$79,231,788	\$28,676
Transportation, Communication, Utilities*	1,011	\$27,351,922	\$27,054
Wholesale Trade	1,329	\$38,198,118	\$28,742
Retail Trade	8,697	\$133,698,981	\$15,373
Finance, Insurance, Real Estate*	1,161	\$35,378,294	\$30,472
Services	9,202	\$204,109,562	\$30,472
Government*	6,252	\$165,122,177	\$26,411

\*1999 Annual Averages

Source: Montana Department of Labor and Industry, Gallatin Development Corp.

Bridger Bowl is among the twenty largest private employers in Gallatin County. As shown in Table 3.12-6, Bridger Bowl currently employs 18 people year-round and another 262 people on a seasonal basis, yielding roughly 81 year-round full-time equivalent jobs. Year-round full-time equivalent is based on a 50 week work year and 40 hours per week. Bridger Bowl seasonal employees work roughly 35 percent of the year, with part-time employees estimated to average about 20 hours per week. The ski area's payroll has increased by approximately 50 percent since 1990, and it reached \$1.9 million in 2002. Based upon data published by the U.S. Chamber of Commerce, it is estimated that the average job in the hotel and amusement industry (which includes ski area employment) generates an additional 1.88 jobs within the socio-economic impact area. Accordingly, it is estimated that Bridger Bowl's total direct and indirect impact on employment in the Gallatin Valley area equates to 526 jobs including full-time, seasonal, and part-time work, or approximately 152 full-time equivalent jobs.

**Table 3.12-6**  
**Estimated Employment Derived from Bridger Bowl**

Employment Source	Total Employment	Total FTE Employment
Direct employment at ski resort		
Full-time year-round	18	18
Full-time seasonal	60	19
Part-time seasonal	202	44
<b>Total Bridger Bowl employment</b>	<b>280</b>	<b>81</b>
Indirect employment from spending off-site		
Within Bozeman/Gallatin Valley	526	152

Sources: Bridger Bowl; What 100 New Jobs Mean to a Community, U.S. Chamber of Commerce Economic Policy Division 1993.

### *Fiscal Considerations*

The Bridger Bowl Inc., operator of Bridger Bowl, is a non-profit corporation organized in the state of Montana. In addition to the employment figures noted previously, the ski area distributes revenue to local, state and federal entities as outlined in Table 3.12-7. The total of direct taxes and fees paid in 2002/2003 was just under \$273,112.

**Table 3.12-7**  
**2002/2003 Taxes and Fees Generated by Bridger Bowl**

Taxes/Fees	2002/2003
Forest Service Special Use Permit	\$30,005
Federal Unemployment & Social Security	\$134,637
State Unemployment	\$42,289
State & County property taxes	\$64,178
<b>Total</b>	<b>\$273,112</b>

Source: Bridger Bowl

### *Ski Area Economics*

As noted earlier in this report, roughly 65 percent of Bridger Bowl's skier visits are attributed to local residents, another 10 percent to other residents of the state of Montana, and 25 percent are attributed to out-of-state skiers. As the local population has grown, demand for skiing has grown at a comparable rate. Table 3.12-8 shows operating characteristics for the ski area over the past ten seasons. Bridger Bowl has received sufficient natural snowfall over the course of each season to remain open into early or mid-April; however, opening dates for the ski area have fluctuated greatly, differing by as much as a full month from one season to the next (such as 1994/95 vs. 2002/03), due largely to the timing of natural snowfall. A late start to the season and a limited amount of terrain open during the vacation week between Christmas and the New Year due to a lack of natural snowfall translates to lower skier visit numbers, decreased revenues, and



fees paid, and reduced income for many employees. Weekend traffic (roughly 30 days during the year) accounts for about 45 percent of total skier visits in most seasons, while the other 55 percent is usually spread out over the 85 or so midweek days, including the holiday week between Christmas and the New Year.

**Table 3.12-8**  
**Operating Characteristics 1993/94 to 2002/03**

Year	Skier Visits	Annual Snowfall	Days Open	Opening Date	Closing Date
2002/03	146,383	238	102	12/26	4/6
2001/02	185,387	266	122	12/7	4/7
2000/01	158,275	182	122	12/8	4/08
1999/00	172,169	242	115	12/17	4/09
1998/99	174,243	323	115	12/10	4/04
1997/98	143,173	286	112	12/22	4/12
1996/97	172,539	373	124	11/29	4/06
1995/96	151,125	227	108	12/22	4/07
1994/95	192,551	365	131	11/25	4/09
1993/94	174,110	230	115	12/10	4/03

Source: Bridger Bowl management

Over the past few years, skier focus groups have identified a quality recreation experience as on with uncrowded slopes, low ticket prices, and access to ridge skiing. These skiers have identified some of the deficiencies in what the Bridger Bowl recreation experience provides. Prior to the completion of the parking expansion, the new base lodge, the ski patrol building, and the remodeling of the Jim Bridger Lodge, base area facilities were over-crowded and unable to accommodate skier visitation during peak days. Generally, the lack of expansion to provide new, different, and varied terrain has hindered Bridger Bowl from meeting the expectations of its skiers. As a result, the resort has faced the potential for reduced economic viability. Refer to the Recreation section (Section 3.10) for more information on this subject.

### *Emergency Services*

Law enforcement to the ski area is provided by the Gallatin County Sheriff. BCR is a State Highway with primary law enforcement by the Montana Highway patrol.

Fire protection is provided by the Bridger Canyon Volunteer Fire Department. Fire equipment is housed at Bridger Bowl in a 1998 expansion of the Bridger Bowl maintenance building. The fire equipment will be housed in this building until 2008, at which time the Fire Department plans to construct another building. Another equipment storage building is located approximately eight miles south along BCR. The Bridger Canyon Volunteer Fire Department has mutual aid agreements with the surrounding fire protection agencies and the GNF. Ambulance Services are provided by private operators under contract to Gallatin County.

Bridger Bowl ski patrol consists of 28 full and part time patrollers. The Bridger Bowl ski patrol provides rescue assistance within the SUP boundary. The ski patrol also provides avalanche hazard reduction activities within the SUP area.

### *Environmental Justice*

As directed by the Civil Rights Act of 1964, NEPA, and Executive Order 12898, all federal actions, programs, and policies shall identify and prevent and/or mitigate, to the greatest extent practicable, disproportionately high and adverse human health and environmental effects on minorities and low-income populations. Table 3.12-9 shows population statistics within Gallatin County and Montana. As shown in Table 3.12-9, the total minority and low income populations in the social and economic analysis area (Gallatin County) are comparable to those in the state of Montana as a whole (U.S. Census 2000). At the census tract level, several areas within the city of Bozeman have poverty levels significantly higher than those of the state or the county (up to 30 percent) (US Census 2000). No concentrations of minority populations were found at the census tract level (US Census 2000). More detailed information used in this analysis is available in the project file.

**Table 3.12-9  
2000 Population Statistics for Gallatin County and Montana**

	Gallatin County	Montana
<b>Race</b>		
White	96.2%	90.6%
Black or African American	0.2%	0.3%
American Indian and Alaska Native	0.9%	6.2%
Asian	0.9%	0.5%
Native Hawaiian and Other Pacific Islander	0.1%	0.1%
Some other Race	6.9%	0.6%
Two or More Races	1.2%	1.7%
<b>Hispanic or Latino<sup>6</sup></b>	1.5%	2.0%
<b>Living Below Poverty Level</b>	<b>12.8%</b>	<b>14.6%</b>

Sources: US Bureau of the Census

The analysis area is not in close proximity to any American Indian Reservations. As described in Section 3.9, no past or current traditional American Indian uses have been identified near the analysis area.

A complete discussion of dispersed recreation on NFS lands in the vicinity of Bridger Bowl is included in Section 3.10. Dispersed recreation may provide alternative recreational opportunities to low-income individuals who cannot afford to ski at Bridger Bowl.

<sup>6</sup> As defined by the US Census Bureau, "People who identify their origin as Spanish, Hispanic, or Latino may be of any race."

### **3.13 TRANSPORTATION**

#### **3.13.1 RESORT ACCESS**

Bridger Bowl is approximately 15 miles northeast of Bozeman, Montana. It is accessible by driving north on State Highway 86, which is also known as Bridger Canyon Road (BCR). BCR is maintained by the Montana Department of Transportation (MDT) and patrolled by the Montana Highway Patrol. The road begins at the intersection of North Rouse Avenue and Griffin Drive in the northeast portion of the City of Bozeman, and extends for approximately 14.5 miles to the intersection of the Bridger Bowl access road. BCR continues past the Bridger Bowl access road and eventually leads to the community of Wilsall where the road intersects US Highway 89, approximately 22 miles beyond the turnoff to the ski area.

BCR is a two-lane paved roadway between Bozeman and the ski area turn-off. The road traverses rolling terrain and gains approximately 1,200 feet of elevation between Bozeman and the ski area turnoff. The road is equipped with yellow centerline striping and white shoulder stripes that delineate the two 12-foot wide driving lanes. The posted speed limit at the West End of Bridger Creek Road is 35 mph, transitioning to 45 mph, and then to 70 mph by the time it crosses the Bridger Creek Bridge.

There are two additional major “T” intersections along the upper portion of BCR at the junctions with Kelly Canyon Road and Jackson Creek Road. BCR is the principal access road serving the residents living in Bridger Canyon, Kelly Canyon, and along Jackson Creek. There are more than 100 driveways accessing BCR between its intersection with Rouse/Griffin and the Bridger Bowl access road.

The Bridger Bowl ski area is accessed by Forest Service Road (FSR) 3200, which is a two-way gravel road from BCR. It extends generally to the west, leading to the ski area parking, administrative offices, and maintenance area. The easternmost portion of this road is also used to access the Bridger Pines Subdivision, which is located adjacent to and northeast of the ski area. As the access road nears the parking area, the two-way operation of the road changes into a one-way loop that circles the parking area in a counter-clockwise direction. A pullout area has been provided for skier drop-off at the top of the loop near the main day lodge. FSR 3200 also continues through the developed ski area and provides additional access onto NFS lands.

#### **3.13.2 TRAFFIC**

##### *General Traffic Volumes for Bridger Creek Road*

MDT collects traffic volume data at several locations on Bridger Creek Road (BCR) as part of their statewide traffic counting program. The 1999 EIS used MDT data from 1995 and 1996 as well as traffic count data conducted specifically for the document in 1997. The most current data available are the Average Annual Daily Traffic (AADT) volumes for 1997-2002 collected by MDT. A combination of data has been used in the SDEIS. Each piece of data collected by MDT and sub-contractors for the 1999 DEIS is correct based on its particular source and intended function. Due to the way the data was collected and used, the numbers between the data sets should not necessarily be compared on a one-to-one basis to determine accuracy or validity.

Three monitoring sites have been identified as best representing traffic along BCR as a result of Bridger Bowl. These three sites are included in the table below and throughout the analysis.

**Table 3.13-1**  
**BCR Average Annual Daily Traffic Volumes 1997-2002**

<b>Year</b>	<b>MP-8 near Kelly Canyon</b>	<b>MP-15 south of Bridger Bowl</b>	<b>MP-17 north of Bridger Bowl</b>
1997	2,090	NA	NA
1998	2,580	730	540
1999	2,000*	810	570
2000	1,770	820	620
2001	2,670	820	590
2002	2,400	910	650
AAGR	2.1%	4.9%	4.3%

\* Estimated based on pre-1997 traffic counts  
Source: Montana Department of Transportation

Historic data collected by the ski area provides background information about the magnitude and frequency of peak ski days at Bridger Bowl. Weekend and holiday use is significantly greater than typical weekday levels. One exception to this is the week between Christmas and New Year's Day when the mid-week activity is higher than typical weekdays. Otherwise, peak ski days occur on Saturdays and Sundays. As displayed in Table 3.13-2, traffic count data collected follows this trend (Peccia, 1997).

**Table 3.13-2**  
**BCR Peak Hour Traffic Volumes p.m.**

	<b>Week Day (vehicles per hour)</b>	<b>Weekend Day (vehicles per hour)</b>
<b>MP-8</b>	504	813
<b>MP-15</b>	387	720
<b>MP-17</b>	70	70

Source: Robert Peccia and Associates Inc., 1997

### *Level of Service*

A Level of Service (LOS) analysis was performed on several segments of BCR and on the major intersections along BCR to determine the impacts of the current operation at Bridger Bowl. The LOS analysis was performed in accordance with the methods outlined in the Transportation Research Board's *Highway Capacity Manual, Special Report 209*. Traffic facilities are graded in the LOS analysis based on their performance and ability to handle the traffic volumes. The results of the LOS analysis are presented in the form of a grading system ranging from A through F.

LOS for a road segment is primarily a function of the number of travel lanes, grades, and passing availability based on passing sight distances and opposing traffic volumes. The LOS at an

intersection is primarily a function of the number of approach lanes, turning movement volumes, and amount of opposing traffic. A facility that receives a LOS A is considered to operate very well with little or no traffic congestion or vehicle delay. A LOS F rating is an indication of system failure or a saturated condition producing significant amounts of traffic congestion and vehicle delay. LOS C or better is desirable, LOS D is considered borderline, while LOS E and F are considered unacceptable.

The LOS analysis on BCR was performed using the peak AM and PM traffic data that included traffic from Bridger Bowl. The analysis was performed using both weekday and weekend traffic conditions. Bridger Bowl traffic used in the analysis represents average peak weekend and weekday conditions. The peak hours used in the analysis correlated to the peak hours of traffic generation at Bridger Bowl. The results of the LOS analysis for the road segments are presented in Table 3.13-3 and the results of the intersection analysis are shown in Table 3.13-4.

**Table 3.13-3  
Road Segment Level of Service (LOS) Analysis**

<b>Segment of BCR</b>	<b>Week Day Peak Hour (p.m.) (without/with ski area traffic)</b>	<b>Weekend Day Peak Hour (p.m.) (without/with ski area traffic)</b>
Kelly Canyon Rd. to Jackson Creek Rd.	LOS B / C	LOS B / D
Jackson Creek Rd. to Bridger Bowl Access Rd.	LOS A / B	LOS A / D

Source: Robert Peccia and Associates, Inc.

The results of the road segment Level of Service analysis indicate that the traffic generated by the ski area increases the traffic on BCR. The resulting LOS B or C on a typical weekday is considered to be acceptable operation for a two-lane highway. Weekend service levels with ski area traffic during peak hours fall to a LOS D.

**Table 3.13-4  
Intersection Level of Service Analysis**

<b>Intersection</b>	<b>Week Day Peak Hour (p.m.) (with/without ski area traffic)</b>	<b>Weekend Day Peak Hour (p.m.) (with/without ski area traffic)</b>
Kelly Canyon Rd. & BCR	LOS A/A	LOS A/A
Jackson Creek Rd. & BCR	LOS A/A	LOS A/A
Bridger Bowl Access Rd. & BCR	LOS A/A	LOS A/B

Source: Robert Peccia and Associates, Inc.

The intersection analysis reveals that without Bridger Bowl traffic, the three main intersections along BCR are functioning at an acceptable LOS A. On days when Bridger Bowl is experiencing peak activity, all of these intersections continue to operate at an acceptable LOS B or better.



### *Traffic Safety along BCR*

Traffic safety data is also collected by MDT. Information was gathered and made available for Highway 86 from Bozeman to the Bridger Bowl access road for July 1, 1998 through June 30, 2003. Over the course of this time period, 185 incidents were recorded. These traffic incidents did not necessarily result in injury or fatality. Approximately 101 of these incidents involved one vehicle only, while the others involved two or more vehicles.

Of these reported incidents, approximately 45 percent occurred during the spring, summer, and fall months, while approximately 55 percent occurred in the winter months during which Bridger Bowl operates (mid-November through mid-April). Approximately 115 of these incidents occurred during the day, while 54 occurred at night, and 11 occurred at dawn or dusk. The other five incident times were not reported. General categories were developed based on tracking information to describe the reason for the traffic incident. Approximately 76 incidents were the result of careless driving, 24 incidents were related to driving too fast, and 22 were alcohol or drug related. The remainder of these incidents falls into the other category, or the reason was not recorded at the time of the incident.

### *Bridger Bowl Access Road*

Historic data at the ski area indicates that over the past ten years the average peak skier day has been 3,389 skiers. Peak morning traffic occurs between 8:30 a.m. and 9:30 a.m., while peak afternoon traffic impacts occur between 4:00 p.m. and 5:00 p.m. Based on this data, an AVO of 2.8, and typical levels of bus transport, it was determined that the number of vehicle trips that would be generated on a peak ski day with 3,389 skiers would be 671 vehicles per hour on the Bridger Bowl access road. This traffic volume reflects the traffic generated by the ski area traveling in both directions on the access road during the peak hour of a peak day.

A separate analysis was also conducted to assess the traffic impacts that would occur on a typical weekday (non-holiday) resulting from average peak weekday ski activity at Bridger Bowl. It was estimated that 1,600 skiers are present on an average peak week day that is not a holiday. This level of activity generates a peak hour traffic volume of 317 vehicles on the Bridger Bowl access road.

### 3.13.3 PARKING

Bridger Bowl hired an engineer to design a parking expansion to meet the criteria set forth in the Bridger Canyon Zoning Ordinance. In 2000, the resort expanded its parking facilities on adjacent private lands. Parking must accommodate guests, buses, employees, and ski area related vehicles (including service and maintenance vehicles). Available space varies during the ski season depending on snow depths and snow storage. Parking space can be reduced during the heaviest snowfalls, as well as through accumulation of snow as the season progresses. By early spring, snow storage can eliminate up to 20 percent of the total available parking in the lot. However, reduced space availability is not usually a problem during the height of the season (Christmas/New Year's holiday). Individual vehicle parking habits can also affect the availability of space in the lot on any given day since spaces in the lot are not marked. In the event that demand exceeds supply, guests park along the Bridger Bowl access road.

### *Ski Area Vehicle Occupancy*

Maximum parking lot vehicle counts were compared to total ticket sales and season pass usage for three weekdays in February 1997 to determine a skier-to-vehicle rate for Bridger Bowl. This rate is used to estimate parking requirements for the ski area. Based on this comparison, the actual weekday skier-to-vehicle occupancy rate was determined to be 2.4 skiers per vehicle. A similar comparison of several weekend days during the past several years resulted in a rate of 2.7 skiers per vehicle. These rates are similar to those of other ski areas in the west, which typically average about 2.7 skiers per vehicle. Overall, Bridger Bowl's vehicle occupancy is a function of the ski area's local draw, and the fact that the drive from Bozeman to Bridger Bowl is a short and easy drive, which provides little incentive for skiers to carpool, and creates more demand for parking at the resort.

### *Transit Service*

Several types and sizes of buses bring skiers to Bridger Bowl throughout a typical ski season. On school days (not weekends or holidays), one to three school buses bring kids from various school systems in the state to the ski school at Bridger Bowl. Local buses also carry kids from nearby areas to the ski area on Saturdays, Sundays, and holidays.

### **3.14 INFRASTRUCTURE AND UTILITIES**

#### *Introduction*

The study area for infrastructure and utilities is the public and private lands associated with Bridger Bowl. This analysis also describes the electric power line that runs from the town of Bozeman along Highway 86 to the ski area.

#### *Forest Plan Direction*

There is no specific Forest Plan direction related to infrastructure and utilities. As a result, this analysis describes the existing conditions at Bridger Bowl with respect to water (domestic and wastewater), power (electric), fuel storage, and mountain access roads.

#### *Domestic Water*

The base area at Bridger Bowl utilizes one well for the Jim Bridger Lodge, the ski patrol building, and the new lodge, which is currently under construction. The water supply system consists of a well and pump, chlorination system, and a 3,400-gallon holding tank. An additional pump will be installed to direct water to the new lodge as well as a backflow preventer and two 300-gallon pressure tanks. The well produces at 34 gallons per minute (gpm) and is capable of supplying up to 22,440 gpd during regular hours of operation. Based on data collected between the 1989/90 and 1998/99 seasons, average water consumption per skier per day was 3.5 gallons as measured at the wastewater treatment plant. In 2002, waterless urinals were installed in the Jim Bridger Lodge, and as a result of this and other water conservation efforts, water use has been reduced to three gallons per skier per day (Bridger Bowl management, 2003). In a conservative estimate using the 3.5 gallon rate, the existing well can accommodate approximately 6,400 people per day, which is in excess of the existing demand at the resort. Recent water sampling (conducted in May, 2002) resulted in measured Nitrate/Nitrite levels of 0.71 mg/L (Montana Microbiological Services, June 2002). The Federal water quality standards for nitrate and nitrite are a maximum of 10 mg/L, respectively (EPA, 1986).

The Deer Park Chalet has its own well with a sustained yield of 20 gpm. This system also has a 3,900 gallon storage reservoir and two pressure tanks to service the facility. This well was also tested for nitrate and nitrite in 2002; analysis showed in measured Nitrate/Nitrite levels of 0.71 mg/L (Montana Microbiological Services, June 2002).

According to water use meters at the resort, Bridger Bowl utilized a total of approximately 770,000 gallons of potable water during the past fiscal year.

#### *Wastewater*

The Deer Park Chalet has its own re-circulating sand filter treatment system, which was built in 1996 to accommodate approximately half of anticipated visitation at the time. The system includes a tank with a minimum volume of 9,450 gallons, a 2,880 gallon pump chamber, a 32 feet by 56 feet re-circulating sand filter, a 7,080 gallon re-circulating tank, and a 2,880 gallon dosing tank, which pressure doses a drain field adjacent to the base area's drain field with 2000 lineal feet of distribution line.

In August 2001, Bridger Bowl received permission from the Montana Department of Environmental Quality (MDEQ) to construct a re-circulating sand filter wastewater treatment system with a capacity to serve approximately 5,400 skiers per day. This system was constructed and incorporated into the existing wastewater treatment system in 2002 to serve the ski area. The system uses one 22,000-gallon septic tank and a pump to transport effluent to the re-circulating sand filter system located approximately 150 feet south of the Sunny Side trail. Effluent is treated twice, and then 20 percent is discharged to the ground via a pressure dosed subsurface drain field. The remaining 80 percent is treated one more time and then discharged to the drain field.

### *Power*

Electric power is distributed to Bridger Bowl via Northwestern Energy. An overhead power line extends from the town of Bozeman along Highway 86 to the ski area. Once the line enters the ski area, it delivers power using lines owned by Bridger Bowl to each of the lifts and facilities via underground and overhead distribution cables. The primary buried power line originates in the base area and continues up Trail 61 before splitting and stepping down at the primary metering can and disconnect at the junction of trails 61 and 62. From this junction, three spurs distribute power to the ski area facilities via the Bridger Bowl power line system. The southern spur follows an existing mountain access road to provide power to the top terminal of the Virginia City lift and the bottom terminals of the Pierre's Knob and Deer Park lifts. The northern spur follows the mountain access road to provide power to the top terminal of the Powder Park Lift and continues down Trail 52 to power the lower terminal of the Alpine Lift.

The third spur power line breaks from the northern spur directly below the Bridger Lift bottom terminal. This buried line provides power to the Bridger Lift bottom terminal and then continues up the lift corridor to provide power to the upper terminals of both the Bridger and Deer Park lifts. An overhead line transmits power from a connection to the north spur along the Bridger lift at the 7,400 foot elevation, crossing over the lower North Bowl and 3 Bears run to the top of the Alpine Lift.

Each of the base area facilities uses electricity for lighting. At the Deer Park Chalet, electricity is also used for heating and cooking purposes. Over the past several years, Bridger Bowl has had an average utilization of approximately 1,406,000 kilowatts of electricity per year.

### *Fuel Storage*

At the maintenance shop, there is one 3,000-gallon fuel storage tank, which has two separate compartments for diesel and gasoline storage. One compartment is 2,000 gallons in size and holds diesel required for the operation of resort vehicles. The other 1,000-gallon compartment holds unleaded gasoline.

Each lift is typically run on electricity, but also has an auxiliary power unit (APU) in case of a power failure or mechanical breakdown. Many of these APUs are diesel although some are powered by gasoline. These units are run for approximately one hour per week to keep them in operating condition in case of actual need.

There are also two propane storage tanks in the base area. The resort's propane supplier is AmeriGas. One 1,000-gallon tank is adjacent to the maintenance shop. This tank is refilled four or five times a year. A 30,000-gallon tank serves both day lodges. This is utilized for heat and as a cooking power source in the resort's kitchens.

#### *Mountain Access Roads*

Due to the extent of the ski area, there are three primary mountain access roads that fork off the Bridger Bowl access road within the SUP area. These roads are utilized during the summer for lift maintenance access. One road goes to the top of the Alpine Lift. Another travels to the top of the Bridger Lift and also accesses Deer Park Lift. The third road accesses Pierre's Knob. Total existing Forest Service, Bridger Bowl roads, and other private roads within the Study Area equal approximately 15.9 miles.



### **3.15 NOISE**

Sound travels through the air as waves of minute air pressure fluctuations caused by vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the source. Sound levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is attenuated over distance. For a given noise source, additional factors affecting the noise impact at a receiver include who is listening, existing sound levels, how long and when the noise event takes place.

The primary sources of noise at Bridger Bowl include construction and maintenance activities, vehicular traffic, explosives used for avalanche hazard reduction activities and trail modifications, and snowmaking. Daytime operations (of lifts and facilities) during the winter create minimal noise. Snowmaking equipment is typically operated at night and occurs for a short duration during the early season. Avalanche hazard reduction through the use of artillery and other explosives cause short sporadic noise that is very loud and can be heard throughout the Bridger Canyon. Bridger Bowl is in a fairly remote forested area that is moderately populated; however, noise from the ski area can occasionally be heard in areas outside the SUP boundary, in private residences located in and adjacent to the base area of the resort.

The Montana State Code does not have any known noise rules or regulations. Additionally, there are no known noise ordinances or regulations in Gallatin County; therefore, there are no noise restrictions for the operations at Bridger Bowl.



# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 4

### Environmental Consequences



Gallatin National Forest  
Bozeman Ranger District

## **4.0 ENVIRONMENTAL CONSEQUENCES**

### **4.1 INTRODUCTION**

This chapter discusses the direct, indirect, and cumulative environmental consequences of implementing the alternatives described in Chapter 2, and it is the basis for comparing them. It also includes adverse environmental effects. An impact is described as any change in physical, biological, social, or economic factors, which result from direct or indirect effects of an action. The impacts may be adverse or beneficial depending on the type of change. Effects and impacts, as used in this chapter, are synonymous. The following impact definitions are used:

- **Temporary Impact:** An impact that occurs during construction and/or for one to two growing seasons thereafter. May also occur after brief activity associated with operations and maintenance.
- **Permanent Impact:** An impact that continues for an extended period of time or lasts throughout the life of the MDP.
- **Direct Impact:** An impact that occurs as the direct result of development activity, including construction, operations, and maintenance. Direct impacts are caused by the action occurring at the same time and place.
- **Indirect Impact:** An impact that develops as the result of a direct impact, and which would not have occurred otherwise. Indirect impacts occur later in time, or further in distance from the action, but are still reasonably foreseeable.

## **4.2 GEOLOGY AND SOIL RESOURCES**

This section describes the potential impacts to soil resources from implementation of any of the action alternatives within the Bridger Bowl Study Area. Temporary impacts to soils include disturbances that will last over a short time period such as creating temporary roads, the clearing of vegetation, grading in areas to be re-vegetated, and utility trenching. Permanent impacts include lift terminal construction, lift tower installation, building construction, and construction of new parking lots. Direct impacts typically have immediate effects in the area of activity and include all of the activities listed above. Indirect impacts include impacts such as increased potential for erosion and mass wasting due to clearing and grading, as well as down slope sediment deposition.

### **4.2.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

There are no activities proposed in the Bridger Bowl Study Area under Alternative 1. Currently, 62.0 acres of the Study Area has permanent impacts to soil productivity resulting from past or ongoing activities such as the construction of ski lifts, ski trails, and associated buildings. Because no new activities are proposed under Alternative 1, there would be no new additional direct or indirect impacts to soil productivity. Since there are no new proposed activities in the Bridger Bowl Study Area under Alternative 1, soil erosion conditions would remain unchanged and the same as existing conditions.

### **4.2.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

#### **Soils**

The proposed activity under Alternative 2 would have approximately 64.3 acres of direct and indirect impacts to soils resources. Permanent impacts would include construction of roads, lift terminals, parking lots and the construction of Limestone Chalet; these would total approximately 7.0 acres. Temporary impacts would occur in both developed and undeveloped areas; temporary impacts in undeveloped areas include construction of lifts, trails, and off-road underground utilities. Most utilities would be buried in road right-of ways and would be categorized as temporary impacts in developed areas (Table 4.2-1). Total temporary impacts to soils would be approximately 57.3 acres. Impacts to soils from clearing without grading would be limited, due to flush cutting techniques, log skidding and removal across snow, and the application of mitigation measures in Table 2.6-1. Existing roads and snow grooming equipment would be used during winter conditions to minimize impacts to ground cover and soils. Impacts to soils from clearing with grading would also be limited, due to similar winter harvest methods and application of mitigation measures in Table 2.6-1.

**Table 4.2-1  
Impacts to Soil Resources within the Bridger Bowl Study Area**

<b>Parameter</b>	<b>Alternative 1 Existing Conditions</b>	<b>Alternative 2 Proposed Impacts</b>	<b>Alternative 3 Proposed Impacts</b>	<b>Alternative 4 Proposed Impacts</b>
Temporary Soil Impacts in Study Area				
Impacts from Clearing (acres)	0.0	+40.5	+37.0	+6.0
Impacts from Grading (acres)	0.0	+16.8	+13.0	+13.5
<b>Total Temporary Soil Impacts (acres)</b>	<b>0.0</b>	<b>+57.3</b>	<b>+50.0</b>	<b>+19.5</b>
Permanent Soil Impacts in Study Area				
Impacts from Roads (acres)	40.3	+4.3	+2.8	+2.9
Impacts from Other Impervious Surfaces	21.7	+2.7	+2.5	+2.5
<b>Total Permanent Soil Impacts (acres)</b>	<b>62.0</b>	<b>+7.0</b>	<b>+5.3</b>	<b>+5.4</b>
<b>Total Soil Impacts (acres)</b>	<b>62.0</b>	<b>+64.3</b>	<b>+55.3</b>	<b>+24.9</b>
<b>% of Study Area w/ Permanent Impacts</b>	<b>2.4 %</b>	<b>+0.3 %</b>	<b>+0.2 %</b>	<b>+0.2 %</b>

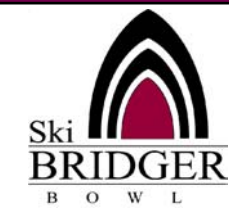
Grading impacts to roads are based on a 30 foot wide road, but permanent impacts are based on 20 foot wide roads. In areas where vegetation clearing and grading occur impacts are categorized as only grading.

Source: SE Group

### **Erosion Hazard**

Alternative 2 would have impacts to soils with varying levels of erosion hazards from the construction of roads, parking lots, lift terminals, and construction of Limestone Chalet. These activities would have approximately 2.8 acres of temporary impacts and approximately 1.7 acres of permanent impacts on high erosion hazard soils (see Table 4.2-2). Moderate erosion hazard soils are wide spread and would have approximately 9.2 acres of temporary impacts and 4.1 acres of permanent impacts. Approximately 4.7 acres of temporary impacts and approximately 1.2 acres of permanent impacts occur on low erosion hazard soils under Alternative 2. The majority of impacts would occur on the low to moderate erosion hazard soils. Mitigation measures would be implemented to prevent large-scale erosion. Impacts to soils would be limited through revegetation of disturbed areas according to the Implementation and Monitoring Plan in Appendix D and the application of mitigation measures.



















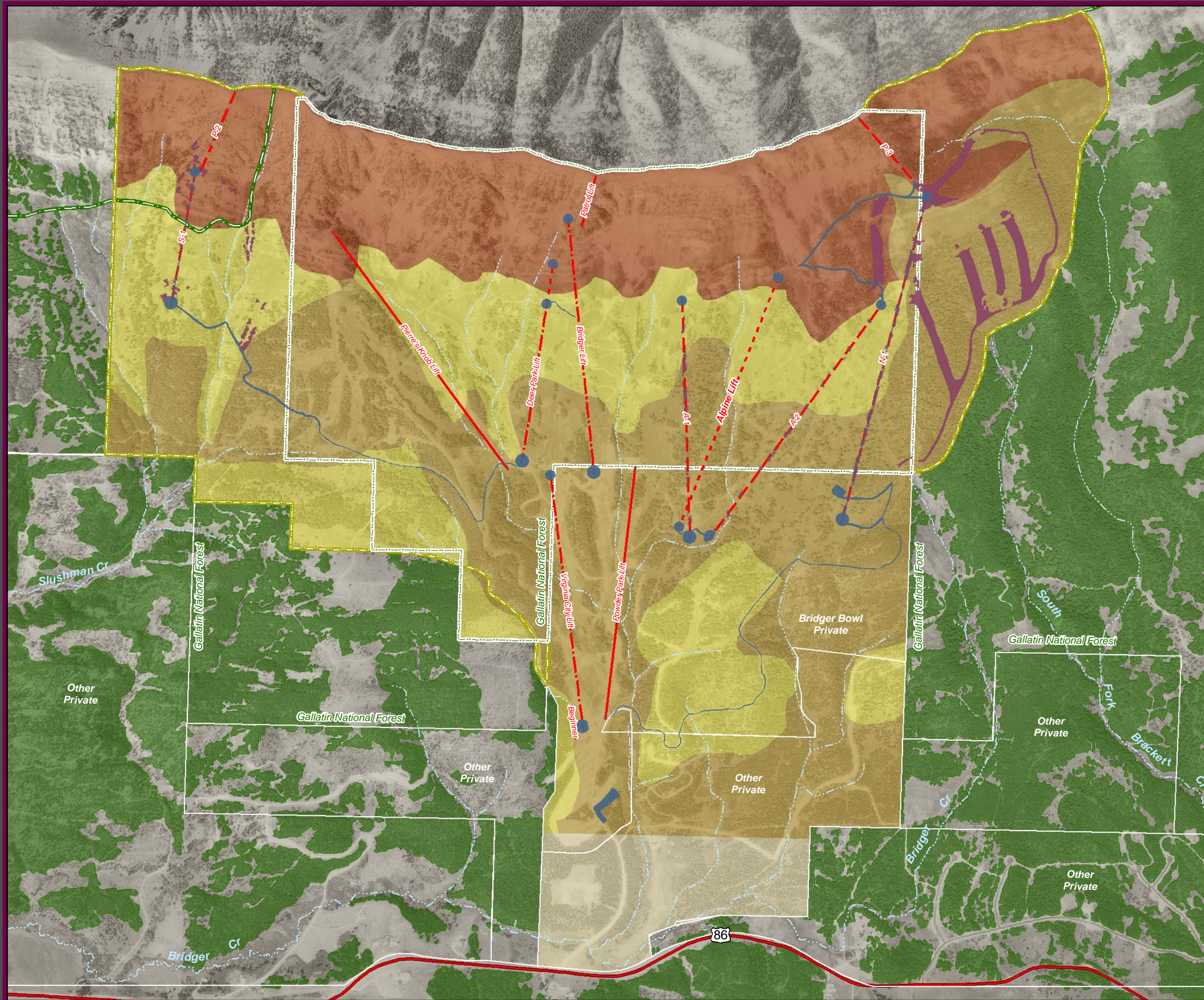
**Bridger Bowl EIS**

**Figure 4-1**

**Proposed Impacts to Soil Erosion Potential Under Alternative 2**

**Legend**

-  Proposed Clearing
-  Proposed Grading
- Soil Erosion Potential**
  -  Low
  -  Moderate
  -  High
  -  Unclassified
-  Existing Lift
-  Existing Lift - Modified
-  Existing Lift - Removed
-  Proposed Lift
-  Existing Special Use Permit Boundary
-  Proposed Special Use Permit Boundary Expansion
-  Forest Service Roadless Boundary
-  Additional Property Boundaries



0 700 1400 2800 feet

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**Table 4.2-2**  
**Impacts to Soils from Grading**  
**by Erosion Hazard within the Bridger Bowl Study Area**

<b>Erosion Hazard</b>	<b>Alternative 1 Existing Conditions</b>	<b>Alternative 2 Proposed Impacts</b>	<b>Alternative 3 Proposed Impacts</b>	<b>Alternative 4 Proposed Impacts</b>
<b>High (acres)</b>				
<i>Temporary</i>	0.0	2.8	2.2	2.1
<i>Permanent</i>	0.0	1.7	1.6	0.8
<b>Moderate (acres)</b>				
<i>Temporary</i>	0.0	9.2	7.7	7.3
<i>Permanent</i>	0.0	4.1	3.3	3.5
<b>Low (acres)</b>				
<i>Temporary</i>	0.0	4.7	3.1	4.1
<i>Permanent</i>	0.0	1.2	0.4	1.2
<b>Totals (acres)</b>				
<b>Temporary</b>	<b>0.0</b>	<b>16.7</b>	<b>13.0</b>	<b>13.5</b>
<b>Permanent</b>	<b>0.0</b>	<b>7.0</b>	<b>5.3</b>	<b>5.5</b>

Source: SE Group

## Sediment Yield

The sediment model includes the four watersheds that are present in the ski area and predicts sediment yield at the mouth of each these watersheds at the scale of the 6,160-acre Watershed Model Analysis Area. Sediment modeling was conducted under the assumption that all new ski area facilities, roads, and trails would be constructed in 2005. This provides a worst-case scenario and a conservative estimate for disclosure purposes since implementation of all project elements proposed under Alternative 2 would likely be constructed over several years; sediment levels would not be as concentrated as this analysis indicates. These estimates, although an attempt to predict actual annual sediment discharge, should be used as a relative comparison between alternatives, and as an indication of sediment recovery rates over time. In order to run the model for the South Fork of Brackett Creek, Maynard Creek, and Slushman Creek, all existing watershed disturbances by date were factored for all of land ownership (roads, timber harvest units, ski trails, ski area facilities, parking lots, residential developments).

SF of Brackett Creek sediment yield is currently estimated at 8.2 percent over natural conditions with existing impacts from roads. Development of Alternative 2 would increase sediment yield in model year 2005 by approximately 1.6 tons per year over existing conditions, which would be 10.1 percent over natural conditions. Sediment yield is projected to recover to near existing condition levels by 2011, which is predicted to be 8.4 percent above natural conditions.

Maynard Creek is currently the most impacted watershed within the Study Area with existing sediment yields estimated at 63.7 tons/year, or 76.9 percent above the natural

sediment yield of 36 tons/year. Proposed development under Alternative 2 is projected to increase sediment by an estimated 2.5 tons/year to 83.9 percent above natural levels in 2005. The sediment modeling predicts Maynard Creek sediment would decrease to 78.6 percent above natural rates by 2011.

Slushman Creek sediment yields are currently estimated at 26.6 percent over natural conditions with 100.0 tons/year of sediment yield. Under Alternative 2 sediment increase in the Slushman drainage would occur from construction of the S1 and P2 lifts, ski runs, and the winter/summer road to provide access back to the bottom of Pierre's Knob lift by an estimated 1.5 tons/year to 28.4 percent over natural conditions. It is anticipated to decline to 27.0 percent over natural conditions by 2011.

**Table 4.2-3**  
**Sediment Yield Potential to Watersheds within the Watershed Model Analysis Area**

<b>Watershed</b>	<b>Alternative 1 Existing Conditions (tons/year)</b>	<b>Alternative 2 Proposed Impacts (tons/year)</b>	<b>Alternative 3 Proposed Impacts (tons/year)</b>	<b>Alternative 4 Proposed Impacts (tons/year)</b>
SF Brackett	89.8	+1.6	+1.6	+0.0
Upper Bridger Creek	161.2	+3.5	+3.5	+2.4
Maynard	63.7	+2.5	+2.5	+1.3
Slushman	100.0	+1.5	+0.0	+1.5
<b>Total</b>	<b>414.7</b>	<b>+9.1</b>	<b>+7.6</b>	<b>+5.2</b>

Source: USFS, Mark Story, 2004.

## Soil Productivity

Soil productivity would also be altered by the proposed activities in Alternative 2. The removal and/or disturbance of the soil profile by roads, parking lots, terminals, and Limestone Chalet construction would be considered a permanent impact. Permanently impacted soil would have a greatly reduced capacity for soil productivity due to the impervious nature of these activities. Approximately 7.0 acres of soil productivity would be permanently impacted by construction of proposed buildings, roads, and parking lots under Alternative 2 (see Table 4.2-1). The soil impacts proposed under Alternative 2 would increase the permanent impacts to soil productivity within the Study Area by 0.3 percent; bringing the total for existing and proposed impacts to 2.7 percent of the Study Area. Temporary impacts to soil productivity from clearing and grading would be limited via flush cutting techniques, skidding and removal of vegetation over snow, and the application of mitigation measures in Table 2.6-1.

### 4.2.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

## Soils

Under Alternative 3, impacts to soils resources would be fewer than those disclosed under Alternative 2, due to the reduction of activities in the Slushman watershed. The SF

Brackett Creek, Upper Bridger Creek, and Maynard Creek watersheds would have approximately 5.3 acres of permanent impacts under the proposed activities in Alternative 3. Temporary impacts to soils would be approximately 50.0 acres. The total area of soils impacted would be approximately 55.3 acres (Table 4.2-1). Similar impact avoidance and minimization activities discussed in the Alternative 2 would be practiced to minimize impacts to soil.

### **Erosion Hazard**

Soil erosion hazard areas could be altered by the proposed activities of Alternative 3, but the impacts would be less than in Alternative 2. The majority of impacts would occur on low to moderate erosion hazard soils. Activities in Alternative 3 would have approximately 2.2 acres of temporary impacts and approximately 1.6 acres of permanent impacts on high erosion hazard soils (Table 4.2-2). Moderate erosion hazard soils are wide spread and would have approximately 7.7 acres of temporary impacts and 3.3 acres of permanent impacts. Approximately 3.1 acres of temporary impacts and approximately 0.4 acre of permanent impacts would occur on low erosion hazard soils as a result of proposed activities in Alternative 3. Similar impact prevention activities previously discussed in the Alternative 2 would be practiced to minimize impacts to soil.

### **Sediment Yield**

Sediment yield impacts of Alternative 3 would be similar to Alternative 2 except that the proposed facilities and trails in the Slushman Creek watershed would not be developed. Sediment yield in Slushman Creek would not be affected by activities proposed under Alternative 3, so the sediment yield would remain at 26.6 percent over baseline as the existing timber sale areas on public and private land outside of the Study Area recover from past timber harvest activities. Alternative 3 sediment impacts to Maynard Creek, Upper Bridger Creek, and SF Brackett Creek would be the same as the impacts disclosed under Alternative 2.

### **Soil productivity**

Soil productivity would be altered by the proposed activities of Alternative 3, but the impacts would be fewer than those disclosed under Alternative 2. Permanently impacted soils would have a highly reduced capacity for soil productivity due to the impervious nature of these activities. Approximately 5.3 acres of soil productivity would be permanently impacted by construction of proposed buildings, roads, and parking lots activities under Alternative 3. The soil impacts proposed under Alternative 3 would increase the permanent impacts to soil productivity within the Study Area by 0.2 percent; bringing the total for existing and proposed impacts to 2.6 percent of the Study Area. Similar impact avoidance and minimization activities previously discussed in the Alternative 2 would be practiced to reduce impacts to soil productivity (see Table 2.6-1).

**Soils**

The proposed activities of Alternative 4 would have impacts to soils, but the impacts would be less than those disclosed for alternatives 2 and 3. Permanent impacts would be reduced due to the reduction in activities in the Bradley Meadows area. Permanent impacts to soils would be reduced to approximately 5.4 acres. Temporary impacts would still occur in areas proposed for clearing and grading and would be approximately 19.5 acres. The total area of soils impacted would be approximately 24.9 acres (Table 4.2-1). Similar impact prevention activities previously discussed in the Alternative 2 would be practiced to minimize impacts to soil.

**Erosion Hazard**

Soil erosion hazard areas would be altered by the proposed activities in Alternative 4, but the impacts would be less than in alternatives 2 and 3. Impacts would be reduced due to a reduction of activities in the Brackett watershed. Activities in Alternative 4 would have approximately 2.1 acres of temporary impacts and approximately 0.8 acre of permanent impacts on high erosion hazard soils (Table 4.2-2). Moderate erosion hazard soils are wide spread and would have approximately 7.3 acres of temporary impacts and 3.5 acres of permanent impacts. Approximately 4.1 acres of temporary impacts and approximately 1.2 acres of permanent impacts would occur on low erosion hazard soils as a result of Alternative 4 activities. Similar impact prevention activities previously discussed in the Alternative 2 would be practiced to minimize impacts to soil.

**Sediment Yield**

Sediment yield impacts of Alternative 4 would be less than alternatives 2 and 3 due to the reduced development in the SF Brackett Creek, Upper Bridger Creek, and Maynard Creek watersheds. Sediment impacts to Slushman Creek under Alternative 4 would be the same as those disclosed under Alternative 2. The increase in sediment yield to Maynard Creek and Upper Bridger Creek would be less than alternatives 2 and 3 since the road access to and trail access from chairlifts N-1 and P-3 would not be constructed. Sediment impacts in the SF Brackett Creek would be the same as Alternative 1 because the expansion of trails and chairlifts in the Bradley Meadows area would not be developed. Sediment yields in SF Brackett Creek would remain at about 8.2 percent over natural conditions.

**Soil productivity**

Soil productivity would be altered by the proposed activities in Alternative 4, but the impacts would be less than those disclosed for alternatives 2 and 3. A reduced level of activity in the Bradley Meadows area would reduce the total amount of impacts to soil productivity. Proposed activities in Alternative 4 would permanently impact soil productivity in approximately 5.4 acres of land. The soil impacts proposed under Alternative 4 would increase the permanent impacts to soil productivity within the Study Area by 0.2 percent; bringing the total for existing and proposed impacts to 2.6 percent of



the Study Area. Similar impact prevention activities previously discussed in the Alternative 2 would be practiced to minimize impacts to soil.

#### 4.2.6 FOREST PLAN CONSISTENCY

A Forest-wide standard that applies to soil and site productivity is as follows: all practices will be designed or modified as necessary to maintain land productivity (USDA, 1987, pg.II-24). The potential increase in permanent soil productivity impacts of 7.0 acres would constitute a slight decrease in land productivity at the Scale of the GNF. Since this Forest Plan standard applies to land management at the GNF scale, the potential impacts from the Proposed Action would be consistent with Forest Plan Standard 10.8 (USDA, 1987, pg. II-24)

The tree clearing proposed in the Proposed Action would follow mitigation measures in Table 2.6-1 and the Implementation and Monitoring Plan in Appendix D. Provided that these mitigation measures and BMPs are followed, the Proposed Action would be consistent with Forest Plan Standard 8.b.1.c, which states, “Site preparation and debris disposal methods will be prescribed which maintain an adequate nutrient pool for long-term site productivity through the retention of topsoil and soil organisms” (USDA, 1987, pg. II-21).

A final Forest Plan Standard that is specific to Management Area 2 requires that erosion control measures be applied to control surface erosion and mass failure hazards on disturbed areas. Proper implementation of the Proposed Action, including mitigation measures and the Implementation and Monitoring Plan, would ensure consistency with this Forest Plan Standard.

### 4.3

## WATER RESOURCES

This section describes the potential effects of each of the proposed alternatives on water resources within the Study Area. A description of the existing conditions of the water resources at Bridger Bowl is presented in Section 3.3 – Water Resources. The analysis of existing conditions in Chapter 3 is the basis by which the proposed development activities within each of the alternatives have been evaluated. It is important to note that the scope of this analysis on the effects of the proposed alternatives is dependent on the nature of the historic and ongoing impacts and the availability of data for the Study Area. All of the alternatives attempt to maintain or improve the existing condition of watershed resources within the Study Area through the implementation of the proposed mitigation measures. GIS analyses using stream, wetland, topographic, and land cover data provided quantitative evaluation of the various alternatives. The primary issues addressed under each alternative include the maintenance or restoration of stream characteristics, wetlands, water quantity, and water quality.

The physical actions associated with components of the alternatives that result in impacts to water resources are referred to as impact mechanisms in this analysis. Impacts can occur during construction, or after construction through ski area operations and maintenance, and they can directly or indirectly affect resource functions. Direct impacts have immediate effects in the area that they occur, while indirect impacts have delayed effects at or some distance from their origin. Indirect impacts up to five years in duration are considered as temporary because monitoring would enable detection and stabilization of most effects well within the implementation period.

#### 4.3.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1

##### **Streams**

Under Alternative 1, no new developments are proposed at Bridger Bowl; therefore, there would be no new impacts to streams within the Study Area. The road network at Bridger Bowl would remain the same; no new stream crossings would occur, and the road density would remain the same. The results of the R1R4 analysis (see Table 4.2-3) show that under Alternative 1, a total sediment load of 414.7 tons per year are delivered to Slushman Creek, Maynard Creek, Upper Bridger Creek, and South Fork of Brackett Creek (SF Brackett) under existing conditions. Currently, these four streams meet GNF sediment standards for Class A and Class D streams.

##### **Wetlands**

Under Alternative 1, there would be no impacts to wetlands in the Study Area; there would remain 41 wetlands for an approximate total of 45.0 acres. Wetlands would continue to provide the same ecological functions as they do under existing conditions.

##### **Water Quantity**

Under Alternative 1, there would be no new impacts to the surface water or the ground water at Bridger Bowl. Annual water yield for each of the watersheds would remain as

described in Chapter 3. The groundwater wells would also remain in existing conditions as described in Section 3.3. Water consumption by visitors would remain at approximately three gallons per person per day, and snowmaking would continue to occur on 27 acres.

## **Water Quality**

Under Alternative 1, sediment yield impacts to watersheds originating in the Study Area would remain at existing levels of 414.7 tons per year (see Table 3.3-4). Under Alternative 1, sediment levels in Slushman Creek would continue to drop as previously disturbed areas continue to recover. Any increased impacts on water yield under the Alternative 1 are expected to be immeasurable. The wastewater treatment systems at Bridger Bowl would continue to operate at their current capacity.

In the foreseeable future, the East Gallatin River, to which the Bridger Creek is a tributary, may be placed back onto the 303(d) list for exceeding TMDLs because it would likely be re-assessed in 2005 (Story, 2003). The Shields River, to which SF Brackett Creek is a tributary, would likely remain on the 303(d) list unless it is rehabilitated and water quality improves (MDEQ, [www.deq.state.mt.us/wqinfo/303\\_d/303d\\_information.asp](http://www.deq.state.mt.us/wqinfo/303_d/303d_information.asp), March 24, 2004).

Bridger Bowl would continue to make maintenance improvements to access roads, parking, and ski trails. This activity would be guided by application of BMPs in Appendix D, and any impacts to water quality would be short-term and/or negligible as long as the BMPs were installed correctly.

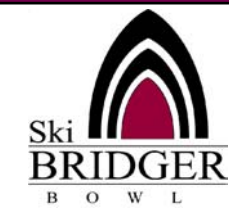
### **4.3.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

#### **Streams**

Any graded areas of land are temporary potential sources of sediment yield impacts to streams until they are stabilized. Watershed developments such as roads, clearcuts, ski trails, buildings, and parking lots can directly impact streams by allowing sediment yield to be eroded directly into streams. As shown in Table 4.3-1, the total length of roads within the study area would increase by 1.8 miles, causing the road density increase from 4.0 mi/mi<sup>2</sup> to 4.4 mi/mi<sup>2</sup>. Another potential source of sediment to streams at Bridger Bowl is locations where streams cross roads, usually either in culverts or under bridges. Under Alternative 2, there would be one new road stream crossing of Slushman Creek, which may be a potential source of sediment to streams within the Study Area.

In Alternative 2, there is a proposed stream road crossing that is located in the Slushman Drainage. Because this culvert installation would require grading work within Slushman Creek, a 310 Permit would be required from the MDEQ. Mitigation measure RP-1 in Table 2.6-1 would minimize potential channel impacts and indirect sediment impacts. In addition, a list of required BMPs and agency guidelines are included in the Implementation and Monitoring Plan in Appendix D of this document.





















**Bridger Bowl EIS**

**Figure 4-2**

*Potential Impacts to Watershed Resources Under Alternative 2*

**Legend**

-  Proposed Clearing
-  Proposed Grading
- Stream Types**
  -  Intermittent
  -  Perennial
- Wetland Types**
  -  Palustrine Emergent
  -  Palustrine Scrub Shrub
  -  Impacted Wetland
-  Watershed Boundary
-  Existing Lift
-  Existing Lift - Modified
-  Existing Lift - Removed
-  Proposed Lift
-  Special Use Permit Boundary
-  Proposed Special Use Permit Boundary Expansion
-  Forest Service Roadless Boundary
-  Additional Property Boundaries

0 700 1400 2800 feet

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**Table 4.3-1  
Road Characteristics in the Bridger Bowl Study Area**

<b>Parameter</b>	<b>Alternative 1 Existing Conditions</b>	<b>Alternative 2 Proposed Impacts</b>	<b>Alternative 3 Proposed Impacts</b>	<b>Alternative 4 Proposed Impacts</b>
Number of Road Stream Crossings				
Perennial	5	+1	0	+1
Intermittent	24	0	0	0
<b>Total Road Stream Crossings</b>	<b>29</b>	<b>+1</b>	<b>0</b>	<b>+1</b>
Length of Roads in Study Area				
Roads on NFS Lands (miles)	8.6	+1.4	+0.8	+0.9
Roads on Private Lands (miles)	7.3	+0.4	+0.2	+0.3
<b>Total Roads in the Study Area (mi.)</b>	<b>15.9</b>	<b>+1.8</b>	<b>+1.0</b>	<b>+1.1</b>
Road Density in Study Area (mile/mile <sup>2</sup> )	4.0	+0.4	+0.3	+0.3

Induced sedimentation from the proposed developments and disturbances in the watersheds draining the Study Area was evaluated using the R1R4 model (Cline et al., 1981). In order to run the R1R4 model for SF Brackett Creek, Upper Bridger Creek, Maynard Creek, and Slushman Creek, all existing watershed disturbances were factored by date for all of the different land cover types (roads, timber harvest units, ski trails, ski area facilities, parking lots, etc.). The results of the analyses are presented in the Geology and Soil Resources section and summarized in Table 4.2-3. The sediment model results indicate that under Alternative 2, a total of 9.1 tons per year more sediment would be delivered to the aforementioned streams, which is a 2.2 percent increase over existing conditions.

## **Wetlands**

Executive Order 11990, Protection of Wetlands, calls for the identification, assessment, and protection of wetlands by requiring Federal agencies to avoid, if possible and practicable, adverse impacts to wetlands and to preserve and enhance the natural and beneficial values of wetlands. As shown in Table 4.3-2, there would be no grading impacts to wetlands under Alternative 2 and there would be a total of 0.48 acres of clearing in wetlands within the Study Area. For any vegetation removal that is done in wetlands, the clearing prescription in Chapter 2 states that trees would be cut flush to the ground, the stumps would not be removed, and trees would be moved by dragging them out over the snow. In addition mitigation measures VM-3, VM-4, and VM-6 have been developed to avoid and/or minimize direct and incidental indirect impacts to wetlands (see Table 2.6-1). Due to the location of wetlands within the Study Area, the clearing prescriptions, and proposed mitigation measures, there would be no significant adverse impacts to wetlands under Alternative 2.



**Table 4.3-2  
Potential Clearing Impacts to Wetlands in the Study Area**

<b>Impact Type</b>	<b>Alternative 1 Proposed Impacts</b>	<b>Alternative 2 Proposed Impacts</b>	<b>Alternative 3 Proposed Impacts</b>	<b>Alternative 4 Proposed Impacts</b>
Wetland Impacts from Grading (acres)	0.0	0.0	0.0	0.0
Wetland Impacts from Clearing (acres)	0.0	0.48	0.48	0.0
<b>Total Wetland Impacts (acres)</b>	<b>0.0</b>	<b>0.48</b>	<b>0.48</b>	<b>0.0</b>

### **Water Quantity**

Developments such as roads, clearcuts, ski trails, buildings, and parking lots can also indirectly impact water resources; reducing transpiration and infiltration by eliminating vegetation and compacting soil all could potentially increase the water yield to creeks within the Study Area. In addition, roads and drainage ditches can increase the efficiency of conducting overland flow to stream systems and increase water yield. Under Alternative 2, the water yield in SF Brackett Creek, Upper Bridger Creek, Maynard Creek, and Slushman Creek is expected to increase slightly with implementation of project elements. In Alternative 2, the projected increases in water yields for the watersheds range from 0.2 percent to 1.0 percent above natural conditions, which is 0.1 percent to 0.8 percent above existing conditions. The projected increase in water yield above existing conditions is considered too small to be measurable. Therefore, Alternative 2 would not change the water yield enough to create any additional channel scour or other impacts to streams.

### **Water Quality**

Sediment guidelines have been developed by the GNF based on fisheries being the primary beneficial use of forest streams. SF Brackett Creek is classified as a Class A stream in the GNF due to the presence of Yellowstone cutthroat trout in the lower reaches of its drainage. According to GNF guidelines, to protect Class A streams, sediment increases should not exceed 30 percent above natural rates. Streams with sediment yields that are within 30 percent of natural rates are considered consistent with the 1999 Memorandum of Understanding (MOU) with the Bureau of Land Management for protecting Yellowstone and westslope cutthroat trout populations through maintaining at least 90 percent of optimum habitat conditions. Section 4.6 – Fisheries contains a more detailed description of the 1999 MOU and the management implications. Assuming all SF Brackett Creek development was done in 2005, the R1R4 model predicted that sediment would increase by 1.6 tons per year to 91.4 tons per year, which would represent an increase from 8.2 percent over natural to 10.1 percent over natural rates. The sediment increase in SF Brackett Creek would decrease to 8.4 percent over natural by 2011. The modeled sediment delivery rate for Alternative 2 for SF Brackett Creek is well below the 30 percent standard set by the GNF to meet conditions of the 1999 MOU.

Maynard, Upper Bridger, and Slushman Creeks are considered Class D streams in the GNF since there is no documented presence of fish in these drainages. The main

emphasis in Class D streams is to maintain geomorphic integrity without excessive downstream sediment discharge. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates. The maximum sediment delivery to Upper Bridger Creek due to construction activities in proposed under Alternative 2 is estimated to increase delivery rates by 3.5 tons per year in 2005, which is an increase from 33.2 percent over natural conditions to 36.1 percent over natural conditions. Maynard Creek sediment would increase by 2.5 tons per year in 2005 to 66.2 tons per year, which is an increase from 76.9 percent over natural conditions to 83.9 percent over natural. The sediment increase in Maynard Creek would decrease to 78.6 percent over natural rates by 2011. Sediment levels in Slushman Creek would increase by 1.5 tons per year to 101.5 tons per year, which is an increase from 26.6 percent over natural rates to 28.4 percent over natural rates. The sediment increase in Slushman Creek would decrease to 27 percent over natural rates by 2011. Increases in sediment yield to these three streams as a result of activities proposed under Alternative 2 would not exceed the 100 percent above natural rates GNF guidelines for Class D streams.

Mitigation measures and BMPs would be used during all of the proposed ski area construction activities to minimize erosion and sedimentation, and to protect water quality. Bridger Bowl would continue to make maintenance improvements to access roads, parking and ski trails, which would be guided by application of BMPs outlined in Appendix D; therefore, any impacts to water quality would be short-term and/or negligible.

As stated previously, the East Gallatin River, to which the Bridger Creek is a tributary, may be placed back onto the 303(d) list for exceeding TMDLs because it would likely be re-assessed in 2005 (Story, 2003). The Shields River, to which the SF Brackett Creek is a tributary, would likely remain on the 303(d) list unless it is rehabilitated and water quality improves. The potential sediment yield impacts from Alternative 2 are expected to be too small to have any measurable impacts on the water quality conditions of either the Shields River or the East Gallatin River. Therefore, Alternative 2 would likely not contribute to the 303(d) listing of these two waterbodies.

Potential water quality impacts from oil and grease pollution from parking lot runoff would be minimized by implementing the mitigation measures listed in Chapter 2 of this document.

#### 4.3.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

##### **Streams**

Under Alternative 3, the total length of roads within the Study Area would increase by 1.0 miles, causing the road density increase from 4.0 mi/mi<sup>2</sup> to 4.3 mi/mi<sup>2</sup> within the Study Area. There are no new road stream crossings proposed in Alternative 3.

## **Wetlands**

Impacts to wetlands under Alternative 3 would be the same as Alternative 2 with a total of 0.48 acres of clearing in wetlands within the Study Area. Mitigation measures VM-3, VM-4, and VM-6 have been developed to avoid and/or minimize direct and incidental indirect impacts to wetlands (see Table 2.6-1). Due to the location of wetlands within the Study Area, the clearing prescriptions, and proposed mitigation measures, there would be no significant adverse impacts to wetlands under Alternative 3.

## **Water Quantity**

In Alternative 3, the projected increases in water yields ranges from 0.2 percent to 1.0 percent above natural conditions, which is 0 to 0.8 percent above existing conditions. The projected increases in water yield would only occur in Maynard Creek, SF Brackett Creek, and Upper Bridger Creek, and is considered too small to be measurable. Therefore, Alternative 3 would not change the water yield enough to create any additional channel scour or other impacts to streams.

## **Water Quality**

Under Alternative 3, the estimated maximum sediment yield in SF Brackett Creek would be 1.6 tons per year. The projected increase in sediment yield would be the same as under Alternative 2, and therefore, Alternative 3 also meets GNF sediment standards for Class A streams. The estimated maximum sediment increase for Upper Bridger Creek and Maynard Creek under Alternative 3 would also be the same as under Alternative 2. Therefore, potential sediment increases to these two streams would meet the GNF sediment standard for Class D streams. No development would occur in the Slushman Creek watershed under Alternative 3 so there would be no new sediment related water quality impacts to Slushman Creek and it would continue to meet GNF standards for Class D streams. The implementation of mitigation measures and BMPs outlined in Appendix D would help reduce potential impacts from development in these areas to streams in the Study Area. The potential sediment yield impacts from Alternative 3 are expected to be too small to have any measurable impacts on the water quality conditions of either the Shields River or the East Gallatin River. Therefore, Alternative 3 would likely not contribute to the 303(d) listing of these two waterbodies.

### **4.3.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4**

## **Streams**

The total length of roads within the Study Area would increase by 1.1 miles, causing the road density increase from 4.0 mi/mi<sup>2</sup> to 4.3 mi/mi<sup>2</sup> within the Study Area. There is one new road stream crossing proposed in Alternative 4, which could be a new source of sediment to streams within the Study Area. Mitigation measure RP-1 in Table 2.6-1 would minimize potential channel impacts and indirect sediment impacts. In addition, a list of required BMPs and agency guidelines are included in the Implementation and Monitoring Plan in Appendix D of this document. Because this culvert installation would

require grading work within Slushman Creek, a 310 Permit would be required from the MDEQ.

### **Wetlands**

Under Alternative 4, there would be no clearing in wetlands within the Study Area because there is no development proposed in the SF Brackett Creek watershed. Due to the location of the Proposed Action to wetlands within the Study Area, there would not be impacts to wetlands under Alternative 4.

### **Water Quantity**

In Alternative 4, the projected increases in water yields over existing conditions is estimated at 0.1 percent for Maynard and Upper Bridger Creeks and 0.2 percent for Slushman Creek which is considered too small to be measurable. Therefore, Alternative 4 would not change the water yield enough to create any additional channel scour or other impacts to streams.

### **Water Quality**

Under Alternative 4, the estimated maximum sediment yield in Slushman Creek would be 1.5 tons per year, which is the same as under Alternative 2 (see Table 4.2-3 in Soil Resources). Increased sediment delivery predicted in the model for Alternative 4 would meet the GNF sediment standard for Class D streams as described for Alternative 2. The estimated maximum sediment increase in Maynard Creek would be 1.3 tons per year, which is 1.2 ton per year less than proposed sediment impacts under Alternative 2. Potential sediment delivery to Upper Bridger Creek under Alternative 4 would be 2.4 tons per year, which is less than the 3.5 tons per year that is estimated for Alternative 2. The estimated increases in sediment delivery to these two streams from Alternative 4 would meet GNF sediment standards for Class D streams because the delivery rates would be less than those estimated for Alternative 2 which meets the standard. Alternative 4 would not result in any new sediment delivery impacts because development would not occur in the Bradley Meadows area. The implementation of BMPs and applicable mitigation measures would help reduce potential impacts from development in these areas to streams in the Study Area. The potential sediment yield impacts from Alternative 4 are expected to be too small to have any measurable impacts on the water quality conditions of either the Shields River or the East Gallatin River. Therefore, Alternative 4 would likely not contribute to the 303(d) listing of these two waterbodies.

#### **4.3.6 FOREST PLAN CONSISTENCY**

Watersheds would be managed by the application of the mitigation measures listed in Chapter 2 and erosion control BMPs identified in the Implementation and Monitoring Plan in Appendix D. Implementation of these practices will ensure that the Proposed Action is consistent with Forest Plan standard 10.2 (USDA, 1987, pg. II-23).

A watershed cumulative effects analysis has been completed to determine if water and sediment yields increase beyond the acceptable limits of the GNF. The analysis

contained in the Cumulative Effects Section (Section 4.16) indicates that the Proposed Action is consistent with Forest Plan Standard 10.3 (USDA, 1987, pg. II-23).

The analysis of potential wetland impacts indicates that no grading or fill activities would take place in wetlands and potential direct and indirect impacts would be minimize through implementation of mitigation measures VM-3, VM-4, and VM-6. Therefore, the Proposed Action is consistent with Executive Order 11990 (Protection of Wetlands) and Forest Service Policy in FSM 2527 as required by Forest Plan Standard 10.5 (USDA, 1987, p. II-23).

The Forest Service would work closely with Bridger Bowl and other private landowners to develop mutually agreeable watershed management direction in order to be consistent with Forest Plan Standard 10.9 (USDA, 1987, pg. II-24).

Wetland mitigation measures comply with Executive Order 11990 (Protection of Wetlands) and Forest Service Policy in FSM 2527 (p. II-23).



## **4.4 VEGETATION**

### **4.4.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

#### **Plant Communities**

No new ski lifts, trails, parking areas, or base area facilities would be developed under Alternative 1; therefore, the existing vegetation communities would not be disturbed. Plant community types would remain as described in existing conditions in Chapter 3. Natural processes and human intervention would continue to modify stand features and character.

#### **Threatened, Endangered, and Sensitive Plant Species**

There were no threatened or sensitive plant species identified within the project area under the 1997 survey. With no action proposed, this Alternative would have no impacts to federally listed or sensitive plant species. Habitat for these species does exist, but would not be impacted under Alternative 1.

#### **Fragmentation and Old Growth**

Alternative 1 would have no direct or indirect effects on old growth habitat because no old growth would be altered. This alternative would also have no effects on forest fragmentation because no actions are proposed that would reduce interior forest or create more forested edge. The forest conditions under Alternative 1 would be as described in existing conditions in Chapter 3. Over time, some increases in the dead and down woody component would occur. The additional down debris is expected to add to understory complexity and low level vertical structure (Novak, 2003). Additionally, it is likely that the amount of old growth forest would increase in the Fragmentation Analysis Area (FAA) over the long term because large portions of mature forests within these compartments would be allowed to grow into old growth forest.

### **4.4.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

#### **Plant Communities**

Implementation of Alternative 2 would modify existing plant communities in the Study Area through clearing of 59.0 total acres of existing plant communities (see Table 4.4-1). Approximately 45.8 acres of forested plant communities and 13.2 acres of non-forested plant communities would be cleared for ski trails, roads, buildings, and chairlifts. Out of the 59.0 acres of clearing, approximately 7.0 acres of vegetation would be permanently removed for the construction of roads, buildings, and lift terminals. Mature and old growth spruce and subalpine fir forest receives most of the proposed impacts with 29.4 of the 45.8 acres of proposed clearing.





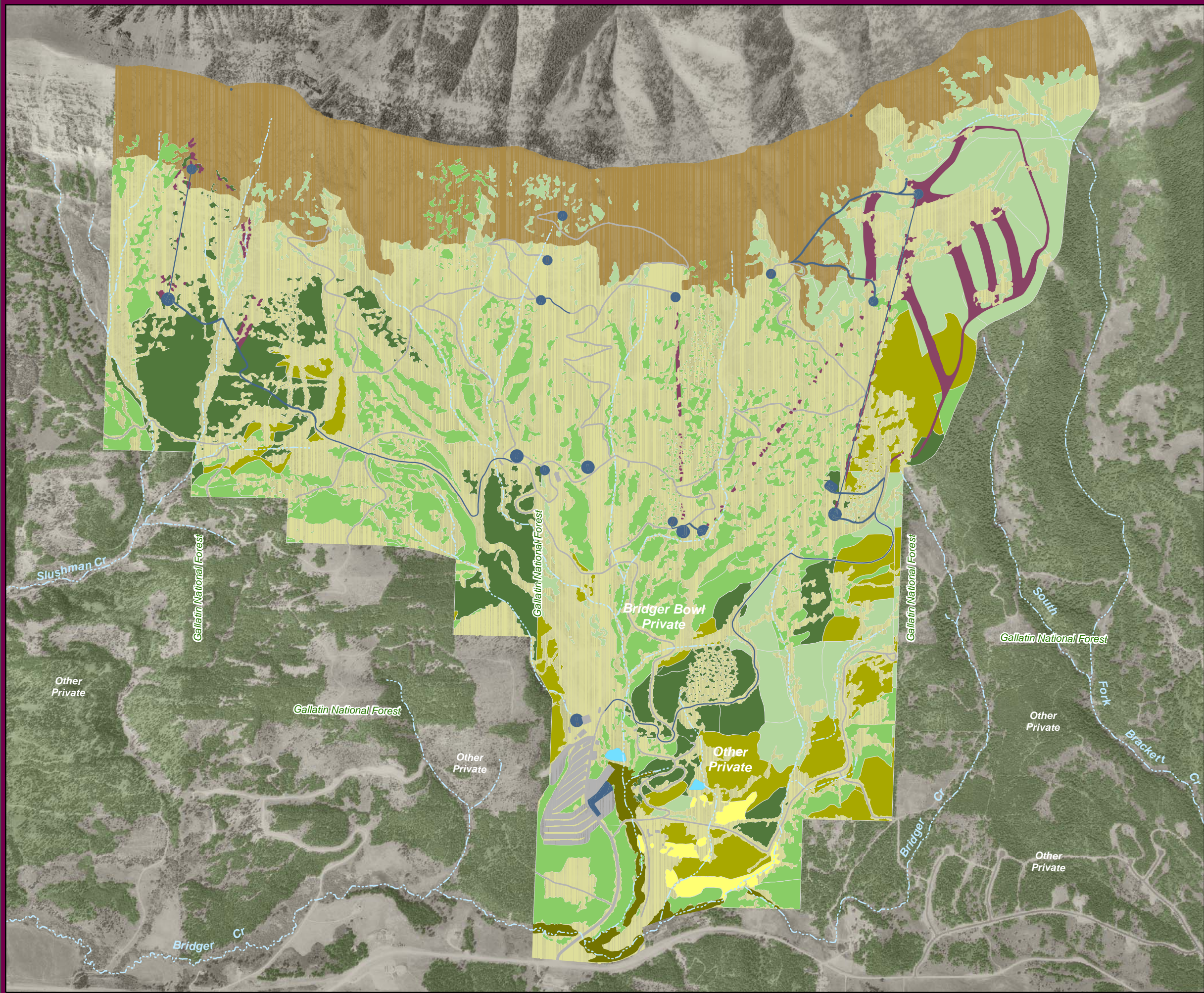
Bridger Bowl EIS

Figure 4-3

Alt 2 Vegetation Community Impacts

Legend

- Proposed Clearing
- Proposed Grading
- Landcover Types
- Developed
  - Rock
  - Open Water
- Vegetation Communities
- Quaking Aspen
  - Spruce/Sub Alpine Fir
  - Douglas Fir
  - Lodge Pole
  - Mixed Conifer
  - Herbaceous
  - Shrub
- Existing Special Use Permit Boundary
- Proposed Special Use Permit Boundary Expansion
- Forest Service Roadless Boundary
- Additional Property Boundaries



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**Table 4.4-1**  
**Plant Community Impacts within the Bridger Bowl Study Area**

<b>Plant Communities</b>	<b>Alternative 1 Existing (acres)</b>	<b>Alternative 2 <sup>a</sup> Impacts (acres)</b>	<b>Alternative 3 <sup>a</sup> Impacts (acres)</b>	<b>Alternative 4 <sup>a</sup> Impacts (acres)</b>
<b><i>Old growth</i></b>				
Douglas Fir	22.0	-0.4	-0.4	-0.0
Lodgepole pine	50.3	-4.1	-4.1	-0.0
Spruce/Sub Alpine Fir	110.6	-12.6	-12.6	-0.1
<b>Total Old growth</b>	<b>182.9</b>	<b>-17.1</b>	<b>-17.1</b>	<b>-0.1</b>
<b><i>Mature</i></b>				
Douglas Fir	290.4	-5.4	-5.4	-4.0
Lodgepole pine	27.7	-0.0	-0.0	-0.0
Spruce/sub alpine Fir	116.7	-16.8	-16.8	-0.3
Mixed conifer	168.2	-3.9	-0.9	-3.3
<b>Total Mature</b>	<b>603.0</b>	<b>-26.1</b>	<b>-23.1</b>	<b>-7.6</b>
<b><i>Immature</i></b>				
Douglas Fir	23.3	-0.3	-0.0	-0.3
Lodgepole pine	77.7	-0.0	-0.0	-0.0
Spruce/sub alpine Fir	39.1	-1.2	-0.5	-0.7
Mixed conifer	29.2	-1.1	-0.0	-1.1
Quaking Aspen	15.3	-0.0	-0.0	-0.0
<b>Total Immature</b>	<b>184.6</b>	<b>-2.6</b>	<b>-0.5</b>	<b>-2.1</b>
<b>Total Forest Cover</b>	<b>970.5</b>	<b>-45.8</b>	<b>-40.7</b>	<b>-9.8</b>
<b><i>Non-forest Cover</i></b>				
Shrub	20.8	-0.0	-0.0	-0.0
Herbaceous	1,072.5	-11.0	-9.1	-8.1
Rock and Talus	449.4	-2.2	-1.8	-1.4
<b>Total Non-forest</b>	<b>1,542.7</b>	<b>-13.2</b>	<b>-10.9</b>	<b>-9.5</b>
<b>Grand Total</b>	<b>2,513.2 <sup>b</sup></b>	<b>-59.0</b>	<b>-51.6</b>	<b>-19.3</b>

<sup>a</sup>The numbers displayed for alternatives 2, 3, and 4 represent impacts to the existing plant community areas listed in Alternative 1.

<sup>b</sup>Total Vegetation Cover does not equal the Study Area size of 2,574 because there are approximately 63.6 acres on open water and developed land that is not vegetated..

### **Threatened, Endangered, and Sensitive Plant Species**

Implementation of Alternative 2 would have no effect on federally listed plant species. Ute Ladies' Tresses (*Spiranthes diluvialis*) occur in meandered wetlands and swales in broad, open valleys, at margins with calcareous carbonate accumulation (MNHP, 2003). Although many wetlands occur within the Bridgers, this habitat type is not common within the steep and narrow valleys of the Study Area. Similarly, the elevation range of Ute Ladies' Tresses, 4050-5080 feet, is well below the Study Area low point of 5900 feet. Ultimately, the sensitive plant survey field maps and plant check list made no reference to the occurrence of Ute Ladies' Tresses. Oregon Checker-mallow (*Sidalsea oregana*), a federally proposed species for listing, occurs in valley grasslands at elevations ranging from 3026-6840. Habitat may occur within the study area but a determination is not required until listed.

Implementation of Alternative 2 would have no effect on the sensitive plant species surveyed for under the 1997 sensitive plant survey, as no sensitive plant species were identified. Under mitigation measure VM-5 (see Table 2.6-1), the two sensitive plant species which were not surveyed for during the 1997 survey, Shoshonea and Small-flowered pennycress, and the three 1999 newly listed plants, would be surveyed for prior to any disturbance relating to proposed activities. Habitat for these sensitive plant species does occur within the Study Area and may be impacted by the proposed alternative.

Habitat for the three sensitive plant species listed in 1999, English sundew (*Drosera anglica*), Slender cottongrass (*Eriophorum gracile*), and Beaked spikerush (*Eleocharis rostellata*) does occur within the Bridger Bowl Study Area. Surveys for these sensitive plant species have not been conducted. The “Sensitive Plant Survey Form” used in the McCarthy 97 sensitive plant survey does not list the occurrence of these species. Impacts to these sensitive plant species can not be determined at this time because a survey was not done specifically for these species in 1997 and would be addressed under mitigation measure VM-5 (see Table 2.6-1).

### **Fragmentation and Old Growth**

The proposed activities under Alternative 2 in the Bradley Meadows area would fragment a portion of the second largest interior forest patch in the FAA. It is important to note that the largest interior forest patch in the FAA is actually located in the Bangtail Mountains. So the interior forest patch in the Bradley Meadows area is the largest patch in the Bridger Range, but the second largest in the FAA. This interior forest patch would change from an existing area of 832 acres to two smaller patches of 413 acres and 182 acres. The other nine interior forest patches within the FAA would not be affected by Alternative 2 (Novak, 2003). The current amount of forested habitat identified within the FAA as interior forest is 35 percent. Interior forest was defined as any patch greater than 80 acres of mature and old growth forest. If the chairlifts and runs proposed in the Bradley Meadows area under Alternative 2 are constructed, interior forest within the FAA would decrease by approximately 2 percent from existing conditions. The reduction of interior forest due to Alternative 2 would be occurring in an area (FAA) where fragmentation is high in relation to other compartments analyzed on the Gallatin National Forest (GNF) (Novak, 2003). Actions proposed in the Slushman Creek Drainage under Alternative 2 would have no effect to the fragmentation of interior forest in the FAA.

Activities proposed under Alternative 2 would clear approximately 17.1 acres of old growth within the Bridger Bowl Study Area. Approximately 75 percent of the old growth impacted would be in the spruce/sub alpine fir plant community type. As directed by the GNF Forest Plan, potential impacts to old growth were also analyzed at the Timber Compartment scale to determine consistency with the Forest Plan. According to GIS analysis, approximately 1.6 acres of existing old growth forest would be cleared in Timber Compartment 504, resulting in a 0.4 percent change in the amount of old growth forest in the compartment. Since the existing amount of old growth in compartment 504 is 7.00 percent, implementation of Alternative 2 would move the percent of old growth further away from the Forest Plan standard of 10 percent (USDA, 1987). In compartment

515, approximately 15.5 acres of existing old growth forest would be cleared, resulting in a 1.5 percent change in the amount of old growth forest in the compartment. This decrease in old growth forest from proposed Alternative 2 activities would change the old growth percentage for the compartment from 11.60 to 11.43 percent, which is above the Forest Plan standard.

**Table 4.4-2  
Potential Impacts to Old Growth Forest by Timber Compartment**

<b>Parameter</b>	<b>Alternative 1 Existing</b>	<b>Alternative 2 Impacts</b>	<b>Alternative 3 Impacts</b>	<b>Alternative 4 Impacts</b>
Old Growth in Co compartment 504 (acres)	413	1.6	1.6	0.1
Old Growth as Percent of Compartment 504 <sup>a</sup>	7.00%	6.98%	6.98%	7.00%
Old Growth in Compartment 515 (acres)	1051	15.4	15.4	0.0
Old Growth as Percent of Compartment 515 <sup>a</sup>	11.60%	11.43%	11.43%	11.60%

<sup>a</sup>The percentages are calculated using the area of old growth forest divided by the amount of forest land in each compartment.  
Source: Forest Service, SE Group

#### 4.4.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

##### **Plant Communities**

Implementation of this Alternative may modify the existing plant communities, but the impacts would be less than in Alternative 2. Through clearing and clearing with grading 55.5 total acres of existing plant communities would be altered. Approximately 45.8 acres of forested plant communities and 14.8 acres of non-forested plant community would be cleared for ski trails and lifts. Road and building construction would modify 3.9 acres of plant communities which would result in permanent impacts.

##### **Threatened, Endangered, and Sensitive Plant Species**

Implementation of Alternative 3 would have no effect on federally listed plant species or the sensitive plant species surveyed for under the 1997 sensitive plant survey. Under mitigation measure VM-12 (Table 2.6-1), the two sensitive plant species which were not surveyed for during the 1997 survey and the three 1999 newly listed plants, would be surveyed for prior to any disturbance relating to proposed activities. Habitat for sensitive plant species does occur within the Study Area and may be impacted by the proposed alternative.

##### **Fragmentation, and Old Growth**

Potential impacts to forest fragmentation from activities proposed in Alternative 3 are the same as described for Alternative 2 above. The actions proposed in the Bradley Meadows area under Alternative 3 would fragment a portion of the second largest interior forest patch in the FAA. The actual impact areas under Alternative 3 would be the same as Alternative 2.



Similarly, Alternative 3 would impact the same amount of old growth forest as Alternative 2, because the components of the two proposals that are the same are located in the Bradley Meadows area where the proposed old growth impacts would occur.

#### 4.4.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

##### **Plant Communities**

Implementation of this Alternative would modify the existing plant communities, but the impacts would be less than in alternatives 2 and 3. Through clearing and clearing with grading 24.6 total acres of existing plant communities would be altered. Approximately 9.8 acres of forested plant communities and 14.8 acres of non-forested plant community would be cleared for ski trails and lifts. Road and building construction would modify 5.3 acres of plant communities which would result in permanent impacts.

##### **Threatened, Endangered, and Sensitive Plant Species**

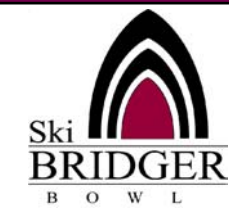
Implementation of Alternative 4 would have no effect on federally listed plant species or the sensitive plant species surveyed for under the 1997 sensitive plant survey. Under mitigation measure VM-12 (Table 2.6-1), the two sensitive plant species which were not surveyed for during the 1997 survey and the three 1999 newly listed plants, would be surveyed for prior to any disturbance relating to proposed activities. Habitat for sensitive plant species does occur within the Study Area and may be impacted by the proposed alternative.

##### **Fragmentation and Old Growth**

Alternative 4 would not effect the fragmentation of interior forest in the FAA because the actions proposed would not alter interior forest in the Bradley Meadows or Slushman drainage areas. However, the proposed S-1 chairlift and associated runs are immediately adjacent to an interior forest patch.

Activities proposed under Alternative 4 would impact approximately 0.1 acres of old growth forest. The proposed impacts to old growth under Alternative 4 would occur in Timber Compartment 504 approximately resulting in no discernable percent change to the remaining old growth forest (see Table 4.4-2). No old growth forest would be cleared in compartment 515 under Alternative 4, resulting in no change to the existing old growth calculation of 11.6 percent for the compartment.





Bridger Bowl EIS

Figure 4-4

Alt 2 Forest Age Class Impacts

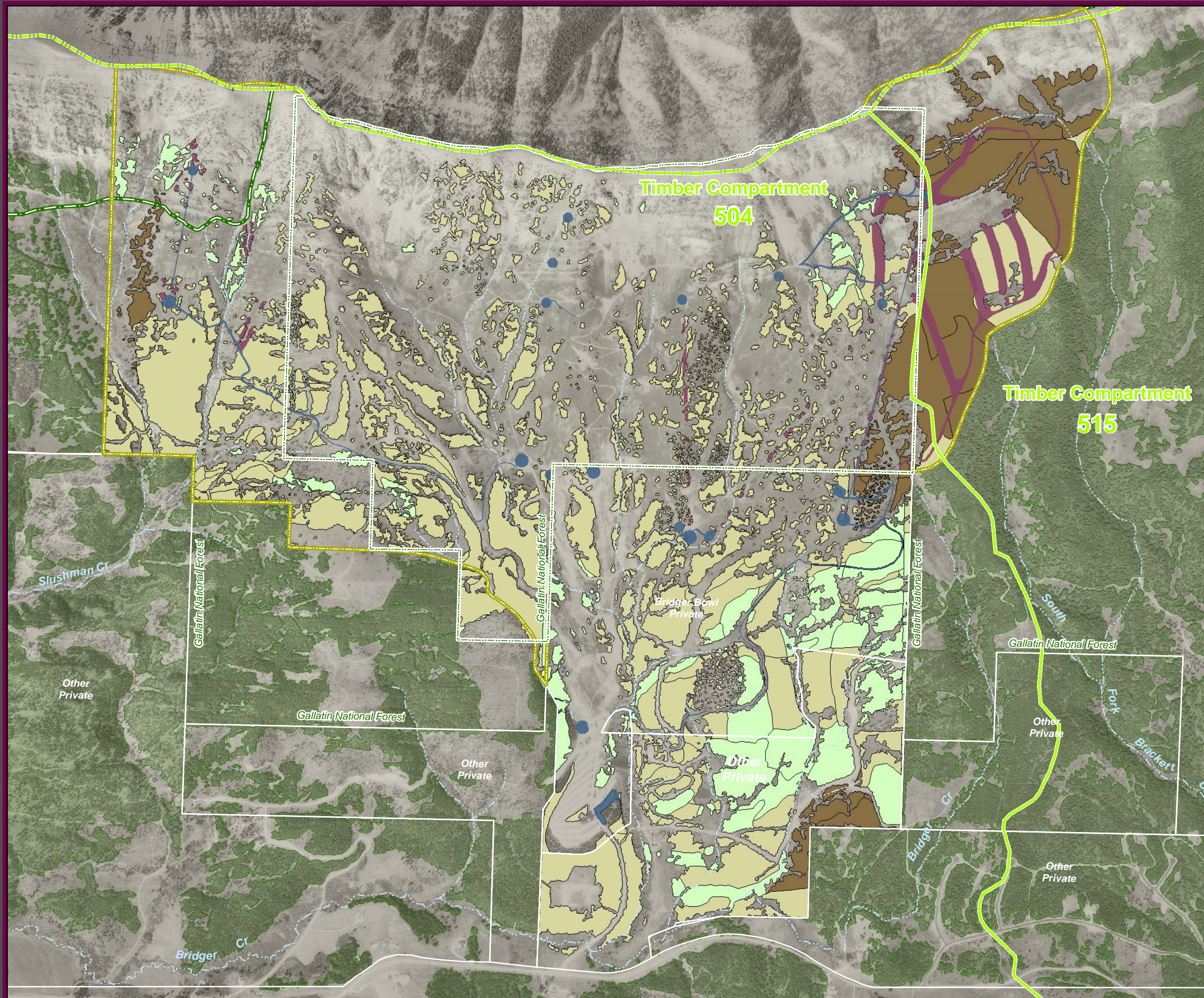
Legend

- Proposed Clearing
- Proposed Grading

Forest Age Classes

- Immature
- Mature
- Old Growth

- Timber Compartment Boundaries
- Existing Special Use Permit Boundary
- Proposed Special Use Permit Boundary Expansion
- Forest Service Roadless Boundary
- Additional Property Boundaries



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#### 4.4.6 FOREST PLAN CONSISTENCY

The Forest Plan standard for old growth is part of the vegetative diversity standard which states; “in order to achieve size and age diversity of vegetation, the Forest will strive to develop a timber compartment successional stage of at least 10 percent old growth timber” (USDA, 1987, pg. II-20). As presented in the analysis of fragmentation and old growth in the sections above, Timber Compartment 515 is currently at 11.60 percent which is above the Forest Plan standard for old growth. Implementation of alternatives 2 and 3 would change the old growth calculation to 11.43 percent, which is still above the Forest Plan standard of 10 percent. Alternatives 1 and 4 would not impact old growth in Compartment 515. Therefore, all of the alternatives are consistent with this Forest Plan standard for old growth in Compartment 515.

Timber Compartment 504 is currently at 7.00 percent which is below the Forest Plan Standard for old growth. Implementation of alternatives 2, 3, and 4 would clear between 0.1 and 1.6 acres of old growth, which would move the old growth percent further from the Forest Plan standard. Since the proposed old growth impacts would move conditions further from the already non-compliant 7.00 calculation, all of the Action Alternatives are inconsistent with this Forest Plan standard for Compartment 504. The Proposed Action includes a proposal for a site-specific Forest Plan amendment to exempt the project from meeting the Forest Plan standard for old growth in the affected timber compartment (see Appendix C). The Forest Plan amendment as described would result in making the Proposed Action consistent with the Forest Plan standard for old growth.

The Forest Plan standards and guidelines specify certain approaches for noxious weed control and vegetation management (USDA, 1987, pg. II-28). The Construction and Implementation plan in Appendix D to this SDEIS contains BMPs and forest service guidance designed to comply with the Forest Plan. The guidance in Appendix D includes measures for limiting distribution of noxious weed species in the Study Area through containment, gradual reduction, and prevention. The Proposed Action is consistent with these Forest Plan standards since the guidelines have been incorporated into the Proposed Action (see Appendix D).

Finally, the Action Alternatives are consistent with the Forest Plan timber standard specific to Management Area 2, which allows tree removal for reduction of safety hazards, to maintain a healthy and diverse vegetative pattern, or to permit construction or expansion of facilities and ski trails (USDA, 1987, pg. III-5).

## **4.5 WILDLIFE**

### **4.5.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

#### **Management Area Designation Change**

Under Alternative 1, there would be no direct, indirect or cumulative effects to MA designation, as there would be no expansion of the SUP boundary and no need to change the current MA designation.

#### **Threatened Species**

##### *Canada lynx (Lynx canadensis)*

At a small ski area like Bridger Bowl, skiers make use of all the available terrain, often skiing through trees that might otherwise provide suitable lynx habitat. Activity occurs both during the day and throughout the night since most of the snow grooming and run maintenance occurs at night, and daily avalanche control operations are conducted during the early morning hours. Given the high level of activity occurring within the existing SUP area, it was assumed that all lynx habitat, regardless of ownership, affected by ski area features or activities is rendered unsuitable for lynx; at least during the winter months. Outside of the ski area, lynx habitat was deemed unsuitable only when all or most of the forest cover has been removed. Considering all lynx habitat in the South Bridger Lynx Analysis Unit (SB LAU), including public and private ownership, there is currently about 2,447 acres, or 20 percent in unsuitable condition (see Figure 3-5).

##### Denning Habitat

Alternative 1 (No Action) would have no effect on lynx denning habitat within the SB LAU, maintaining the proportion of lynx habitat in a condition suitable for denning at 22%.

##### Foraging Habitat

Alternative 1 (No Action) would have no effect on lynx foraging habitat.

##### Connectivity

Alternative 1 (No Action) would have no further impact on lynx habitat connectivity.

##### *Bald eagle (Haliaeetus leucocephalus)*

Bald eagles are observed in the Study Area primarily during fall migration, before major ski area operations begin. From late September to October there is an annual raptor migration study conducted by Hawk Watch International (HWI) from the ridge above Bridger Bowl. This study involves monitoring raptors using the Bridger migratory flyway. In addition, Bridger Bowl has been a partner in an annual fall "Raptor Festival" which includes educational programs for the general public as well as raptor viewing

from a platform located on the ridge above Bridger Bowl. Monitoring by HWI has been ongoing since 1990 and the Raptor Festival has been held annually since 1996. Bald eagles do not appear to be disturbed by the HWI surveyors as counts continue to reflect a considerable number of bald eagles using the flyway each year. The migrating raptors do not appear to be disturbed by large numbers of people viewing from the platform, as the people are located well below the flyway. HWI survey counts continue to reflect a considerable number of bald eagles using the flyway each year. Under Alternative 1, there would be no effects to bald eagles due to their limited presence in the Study Area.

### **Proposed Species**

#### *Gray wolf (Canis lupus)*

There have been no verified sightings of wolves in the Bridger Range since their reintroduction into the Yellowstone Ecosystem as a non-essential experimental population (Pers. Comm. Joe Fontaine). Key habitat for the gray wolf includes big game winter ranges in which prey can be found in high densities (Jones 1983). The Study Area does not provide winter range for most big game species due to deep snow accumulation. Big game winter range in the Bridger Mountains is primarily located at the lower elevations on the west side of the range (Pac et al. 1991). As the wolf population expands beyond the borders of Yellowstone National Park, they could be expected to eventually reach the Bridger Range and would be expected to be associated with big game populations. Existing Bridger Bowl operations are not impacting big game in the Bridger Range therefore there would be no direct or indirect effects to the gray wolf population under Alternative 1.

### **Forest Service Sensitive Wildlife Species**

#### *Peregrine falcon (Falco peregrinus)*

Portions of the Bridger Range represent potential peregrine falcon nesting habitat and are designated as such in the Forest Plan (USDA 1987). There are no known breeding pairs in the Bridger Range; however peregrines are seen during fall migration along Bridger ridge. Due to restriction of Bridger Bowl activities to the winter months when peregrines are not present in the area, there would be no direct or indirect effects to peregrine falcons under Alternative 1.

#### *Flammulated owl (Otus flammeolus)*

The flammulated owl is not expected to occur within the Study Area due to the lack of suitable habitat. As such, direct, indirect and cumulative effects associated with Bridger Bowl activities would be negligible. Therefore, there would be no direct or indirect effects or impact on flammulated owls under Alternative 1.

#### *Black-backed woodpecker (Picoides arcticus)*

There are no recent burns or other insect/disease conditions near the existing Bridger Bowl SUP that would provide suitable nesting and/or foraging habitat for black-backed



woodpeckers. Existing ski trails, roads and chairlift lines provide fuel breaks that reduce the potential for future fires to create suitable black-backed woodpecker habitat within the Bridger Bowl boundary. Due to the lack of suitable habitat for black-backed woodpeckers within the existing Bridger Bowl boundary, there would be no direct and indirect effects to this species under Alternative 1.

#### *Wolverine (Gulo gulo)*

Under Alternative 1 ski area operations would remain the same, with no changes inside the existing permit area and no expansion. Under this alternative the only direct and indirect effects to wolverine habitat would occur as a result of ongoing activities within the existing SUP boundary. Direct effects to wolverines under this alternative would occur primarily as a result of disturbance from high levels of human activity and subsequent displacement of wolverines from potential denning and foraging opportunities that are available within the ski area boundary. The existing SUP boundary contains approximately 435 acres of wolverine denning habitat (see Table 3.5-2). This means that about 16.8 percent of the available denning habitat in the Wolverine Analysis Area is located within the existing ski area boundary (see Figure 3-6). Since females at den sites tend to be highly sensitive to human disturbance and the denning period overlaps with the ski season, it is very unlikely that a wolverine would select a den site within the existing ski area boundary.

Indirect effects could occur due to snow compaction produced by grooming equipment and skier traffic. Snow compaction could preclude snow tunneling often associated with wolverine natal dens and resting areas. In addition, the wolverine's large foot size relative to body size gives it a competitive advantage over other predators and scavengers in deep snow conditions (Banci 1994:113). Snow compaction could reduce this advantage by allowing easier access for coyote and bobcat. Although continued recreational use within the existing ski area boundary would likely have some direct and indirect effects on wolverines as described above, these effects are expected to be minor, since wolverines have coexisted with activities in the existing ski area for several generations, and resident animals appear to have adapted to ski area activities.

Alternative 1 involves continuing permitted actions within the existing ski area boundary, with no new development and no expansion on national forest lands. Since wolverines in the Bridgers have adapted to existing ski area operations over time, it has been determined that this alternative would have no impact on wolverines.

#### *Northern goshawk (Accipiter gentilis)*

Alternative 1 would pose minimal impacts to goshawks in the Bridger Range. The most important limiting factors for goshawk populations include nesting and foraging habitat. Nesting habitat in Montana is typically composed of dense, mature to old-growth stands, on moderate slopes (15-35 percent) with northerly aspects (Hayward and Escano 1989). Although suitable nesting habitat occurs within the existing Bridger Bowl boundary, it is not likely to be impacted by general Bridger Bowl maintenance as skiers typically do not frequent these dense forested areas and there would be less concern over potential

hazards. Existing Bridger Bowl maintenance practices would not affect goshawk foraging habitat during the non-winter seasons. Goshawks may winter in the Study Area, although their presence during the ski season has not been confirmed by surveys (USFS 2000). Bridger Bowl operations in winter would not significantly impact goshawk foraging habitat. Goshawks feed on medium-sized birds and mammals such as jays, grouse, squirrels and rabbits; prey species that are common within the Bridger Bowl boundary.

*Western big-eared bat (Corynorhinus townsendi)*

Under Alternative 1, explosives used for avalanche control purposes could result in disturbance of hibernacula in the vicinity. However, the fact that this method of avalanche control has been practiced for multiple decades at Bridger Bowl and the lack of known caves suitable for winter roosts makes this type of disturbance a remote possibility at best in the vicinity of Bridger Bowl Ski Area. Direct impacts would occur during summer maintenance operations, and trail maintenance, including hazard tree reduction, which may remove suitable summer roosting habitat for individual bats.

*Northern leopard frog (Rana pipiens)*

The northern leopard frog is typically found in and around wet meadows, ponds, and riparian areas where there is an abundance of vegetation to provide cover. Outside of the breeding season they may be found in upland areas. There has been no documented presence of northern leopard frogs within the Study Area (State of Montana, Natural Heritage Program Database, 1999). The continued operation of the Bridger Bowl Ski Area is not expected to impact the northern leopard frog.

*Boreal toad (Bufo boreas boreas)*

The boreal toad is known to exist in western Montana and Yellowstone National Park. They occupy a diverse range of habitat types, from wetlands and aquatic environments during the breeding season, to sagebrush meadows and forested areas outside of the breeding season. Despite the availability of suitable habitat within the SUP area there has been no documented presence of boreal toads within the Study Area. The continued operation of the Bridger Bowl Ski Area is not expected to impact the boreal toad.

**Management Indicator Species**

*Pine marten (Martes americana)*

Under Alternative 1, marten could be attracted to Bridger Bowl facilities by human food and/or garbage. Indirect impacts could result through removal of suitable habitat components such as trees, logs, snags and rocks for Bridger Bowl hazard reduction purposes. These types of features could provide suitable denning habitat for pine marten. Snow compaction from grooming operations and skier traffic could also affect prey availability by reducing subnivean small mammal populations. However, pine marten are considered dietary generalists and opportunistic foragers (Simon 1980), and although most winter prey in western states are captured under the snow, squirrels are also hunted

in trees (USDA 1994b). Pine marten and skiers have coexisted at Bridger Bowl for several decades. There are no additional direct or indirect effects associated with Alternative 1.

### *Migratory birds*

Under Alternative 1 small amounts of nesting habitat might be removed or degraded through general maintenance procedures such as brush clearing and hazard tree/limb removal. This type of routine maintenance work would occur along existing trails, roads, and lift lines where forest dwelling birds would not likely nest. Edge and shrub/scrub nesting birds could be affected by general maintenance however these activities are expected to affect only a negligible proportion of bird nesting habitat available within the SUP.

### *Game birds and mammals*

Several species of game birds and mammals occur in the Study Area including blue grouse, ruffed grouse, elk, mule deer, white-tailed deer, moose, mountain goat, black bear, and mountain lion. These species have co-existed with Bridger Bowl operations for several decades and would not incur additional impacts under Alternative 1.

### *Road Density*

Under Alternative 1, there would not be an increase in road density within the existing SUP.

## **Other Species of Interest**

### *Boreal owl (Aegolius funereus)*

Under Alternative 1, suitable nest trees could be removed through general maintenance of ski trails and hazard reduction. However, the likelihood of boreal owls selecting nest trees near ski lifts or trails is remote because their breeding time frame (courtship and nesting behavior begins between mid February and mid April) overlaps with the general ski season and owls would most likely seek to establish a nest site away from human activity. Under Alternative 1, there would be no new direct or indirect effects to the boreal owl.

## **4.5.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

### **Management Area Designation Change**

Under Alternative 2, expansion to the north would result in approximately 217.3 acres of land currently designated MA 12 being converted to MA 2. Expansion to the south would result in the conversion of approximately 16.7 acres of MA 11 to MA 2 (USDA 1987). The Management Area 12 designation consists of forested big game habitat and includes productive forest lands that are available for timber harvest, provided that big game objectives are met (USDA 1987). The Management Area 11 designation consists

of areas that provide important habitat for summer or winter wildlife use in a variety of terrain and vegetative types as well as offering dispersed recreation opportunities (USDA 1987). Changing MA designation is an administrative process that has no direct effect on wildlife resources.

Indirect effects of changing MA designation would occur as a result of different management actions being allowed. For example, under MA 11 winter recreation activities would not be allowed on important winter range if they disrupt big game use and under MA 12 recreation activities could be restricted on important wildlife habitat (USDA 1987). Under MA 2, recreation activities would not be restricted to protect wildlife resources. By changing MA we set precedent that could lead to activities being permitted where they might not have been allowed under the original MA designation.

Changing MA 12 to MA 2 in the north expansion area would allow forest clearing and construction of roads, lifts, and ski trails in what has been designated as important wildlife habitat (USDA 1987). The proposed development in the north expansion area includes the construction of portions of one lift, five ski runs and a road in an area that is currently designated MA 12. This area provides summer and/or winter habitat for a variety of wildlife including wolverine, lynx, marten, big game, migratory birds and other species. The development proposed in this area would require tree removal and other activities, which would result in a permanent alteration of habitat for numerous species.

Changing MA 11 to MA 2 in the south expansion area would affect approximately 16.7 acres of forested big game habitat. This area provides summer range for elk, and deer, and year-round habitat for moose. There are no proposed activities that would result in habitat modification in what is currently MA 11, therefore potential impacts to big game would be minimal.

## **Threatened Species**

### *Canada lynx (Lynx canadensis)*

A thorough analysis of lynx habitat was completed in February 2003 for the *Biological Assessment for the Bridger Bowl Ski Area Master Development Plan* (BA), which is located in Appendix C of this SDEIS. The BA analyzed the potential effects of the 2002 Master Development Plan update which was based on the preferred alternative in the 1999 DEIS and included recently completed updates to the private lands in the base area. The U.S. Fish and Wildlife Service (USFWS) approved the BA in their *Biological Opinion on the Effects of the Bridger Bowl Ski Area Expansion on Canada Lynx* in June 2003 (USDI 2003). Since that time, the vegetation and habitat mapping in the Bridger Bowl Study Area has been updated for the 2002 Master Development Plan to reflect some additional, recently completed, projects on private lands. A description of the recent changes to the Master Plan and the current scope of the Proposed Action are contained in Section 2.3 - Modifications to the Bridger Bowl Master Plan Proposal. The Canada lynx section in this SDEIS addresses the potential impacts to lynx from the Proposed Action and the subsequent Action Alternatives. The modifications to the Master Development Plan were minor and resulted in fewer impacts to lynx habitat

overall and do not affect the determinations made by the Biological Assessment or the Biological Opinion.

Although some suitable denning habitat exists within the current ski area SUP boundary, and some would likely remain in the proposed SUP area with implementation of full expansion, for analysis purposes, a worst-case scenario was considered, assuming that necessary habitat components could be removed from intertrail tree islands, thus rendering entire blocks of existing habitat unsuitable for lynx denning purposes.

The Proposed Action would reduce the amount of suitable lynx habitat available within the Study Area. Direct impacts would include the thinning and clearing of forested cover and the removal of brush, stumps, snags, logs and lower tree limbs. The existing SUP area was not considered to contain any suitable denning or foraging habitat due to the sparse vegetation and the high level of human activity, including nighttime trail grooming and morning avalanche control; however use of the area by lynx is not precluded, especially during the summer months. Table 4.5-1 lists the acreage of mature and old growth forest impacted under each Action Alternative. Under Alternative 2 the old growth and mature subalpine and lodgepole forests in the northern expansion area would be reduced by 27.6 acres. The southern expansion area which contains mature mixed conifer forest would be reduced by 2.9 acres. The Proposed Action may disrupt the use of foraging, security and denning, and connectivity habitat, however, these modifications within the expansion areas are not likely to significantly disrupt normal behavior patterns, including breeding, feeding, or sheltering to levels resulting in injury to the Canada lynx (USDI 2003). Effects to key habitat components are discussed below.

**Table 4.5-1  
Impacts to Mature and Old Growth Forested Habitat within the Study Area**

	<b>Species Primarily Associated with Mature/OG Forest</b>	<b>Existing Forest (Alt. 1)</b>	<b>Alt. 2</b>	<b>Alt. 3</b>	<b>Alt. 4</b>
<b>Northern Expansion Area (acres<sup>1</sup>)</b>	elk, moose, deer, lynx, wolverine, boreal owl, northern goshawk, pine marten	193.54	- 27.6	- 27.6	- 0.0
<b>Southern Expansion Area (acres<sup>1</sup>)</b>	elk, moose, deer, lynx, wolverine, boreal owl, northern goshawk, pine marten	95.17	- 2.9	- 0.0	- 2.9
<b>Existing SUP area (acres<sup>1</sup>)</b>	--	497.19	- 12.7	- 12.6	- 4.8
<b>Total (acres<sup>1</sup>)</b>	--	785.9	- 43.2	- 40.2	- 7.7

<sup>1</sup> Area totals may not agree precisely with the Study Area size of 2,574 acres due to rounding.

### Denning Habitat

Alternative 2 would reduce lynx denning habitat through the clearing of mature and old growth forest for lifts, roads, and ski trails. Direct effects would result from development associated with the Proposed Action. Construction would remove approximately 30.5 acres of lynx denning habitat through the clearing of mature and old growth forest in the



northern and southern expansion areas (see Table 4.5-1). An additional 12.7 acres of mature forest would be removed from the existing SUP area. In order to provide for public safety, Bridger Bowl may need to remove lynx denning habitat components such as snags, logs, roots, stumps, and lower tree limbs, where such features could affect the safety of skiers on developed runs.

Indirect effects would impact approximately 193.5 acres of lynx denning habitat within the northern expansion area and 95.2 acres of denning habitat within the southern expansion area. Indirect effects to lynx denning habitat would result from the forest fragmentation associated with lift, run, and road construction (see Figure 4-4). Lynx have relatively specialized habitat needs and can be impacted by forest fragmentation through the creation of openings, which can confer a competitive advantage to habitat generalist species such as coyotes (Buskirk et al. 2000). Within fragmented lynx denning habitat, the potential advantage for generalist predators could increase the vulnerability of lynx kittens to predation. For purposes of this analysis, it was therefore assumed that the narrow strips of mature forest maintained between developed runs would not provide suitable lynx denning habitat. Strips of forest left between cleared runs would be narrow; in most cases less than 500 feet wide (see Figure 4-4). Forested areas cleared for lifts, roads and ski trails would remain as unsuitable lynx habitat for the life of the ski area. These areas would not be allowed to regenerate to a condition where they could provide suitable denning habitat. Additional indirect effects would include increased human activity outside of established trails since the forested habitat affected by the proposed action is relatively open compared with younger forest, and would most likely be subject to tree skiing between established runs.

#### Foraging Habitat

Alternative 2 includes actions that would not result in the removal of any immature lodgepole pine forest, which is identified as the primary foraging habitat of lynx. Removal of 30.5 acres of old growth and mature forests within the northern and southern expansion areas, which contain some habitat for snowshoe hares in addition to secondary prey species such as red squirrel and grouse, would directly affect lynx foraging habitat (see Table 4.5-1, Figure 4-4). Direct effects would occur in the form of actual habitat loss. Although the Proposed Action would directly remove some lynx foraging habitat, the proportion affected would be minor and would result in little or no change in the overall availability of lynx foraging habitat in the SB LAU.

Indirect effects could result from the fragmentation of relatively large contiguous blocks of mature forest habitat. Increased forest openings can facilitate access into lynx foraging habitat by more generalist predators that could compete with lynx for available prey (Buskirk et al. 2000). Resulting snow compaction from skier and groomer activity might reduce the competitive advantage lynx and snowshoe hares have over other winter wildlife residents. Generalist species tend to dominate the predator guild in more fragmented forest landscapes. The Bridger range hosts a suite of predator species, including mammalian species such as mountain lions, bobcats and coyotes, plus avian predators including golden eagles, great horned owls, red-tailed hawks and northern

goshawks, all of which include snowshoe hares in their diets, and thus compete with lynx.

The permanent habitat alteration produced by clearing of forest for lifts, roads and ski trails contributes additional indirect effects to lynx foraging habitat. Whereas natural succession would normally regenerate cleared forest land back into good foraging habitat for lynx, ski area features would be maintained in a non-forest condition in perpetuity, and thus remain as unsuitable foraging habitat. Dense growth of conifer and/or shrub habitat is not conducive to good skiing so these habitat types are not typically promoted or maintained within the ski area.

### Connectivity

Alternative 2 includes development of a ski lift and trails (N2, N3, N4, N5, N6, and N8) in the north expansion area that would fragment a portion of the largest remaining contiguous block of mature and old growth forest that currently exists in the southeast Bridgers (see Figure 4-4) (Novak, 2003). Lynx would still likely find enough cover for travel and resting in the affected areas, but the structure that currently provides high quality denning habitat and some foraging opportunities would be removed or degraded through development in the north expansion area. Similar habitat connectivity degradation would occur in the south expansion area though this area contains smaller intact blocks of mature forest than the northern expansion area. Lynx habitat within the existing SUP boundary is currently quite fragmented due to naturally sparse vegetation and ski trail development, so development proposed within the existing area would not have notable effects on habitat connectivity.

Indirect effects of the Proposed Action would result from the permanent alteration of habitat due to ski area development. Removal of forest cover for the development of ski lifts, roads, trails and other facilities results in permanent openings that perpetuate the fragmentation of continuous lynx habitat. As discussed above under impacts to denning and foraging habitat, forest fragmentation could lead to a competitive advantage for more habitat generalist species over lynx. Competition between lynx and other predators such as mountain lions, bobcats, coyotes, eagles, hawks and owls can take two primary forms. Exploitation competition results when other species directly compete with lynx for prey (most notably snowshoe hares). Interference competition occurs when larger and/or more aggressive species displace lynx from kills or good hunting ground, and can even involve direct injury and/or mortality inflicted on adult lynx and their offspring (Buskirk et al. 2000). Competition effects can have notable influence on carnivore populations. Actions connected with ski area development and resulting forest fragmentation might also indirectly affect lynx. Increased forest openings, higher road densities, residential development and increased snow compaction would all further contribute to the breakdown of lynx habitat connectivity.

Habitat continuity for lynx would be degraded, but not necessarily compromised under Alternative 2. The expansion is not expected to limit the lynx from moving within or through the LAU. Lynx would likely find enough cover for travel and resting (USDI 2003).

*Bald eagle (Haliaeetus leucocephalus)*

Under Alternative 2, activities associated with construction of new lifts and creation of new ski trails would occur. Noise from mechanized equipment and/or explosives used in the construction process could disturb and/or displace individual birds from using the thermal air currents directly over the Study Area. The impact from such disturbance is expected to be minor and temporary. There is potential for collisions with helicopters used for construction during the fall migration period (September-October). This issue is addressed in Table 2.6-1. The USFS determined that Proposed Action would have no effect on bald eagle populations within the Study Area (USDA 2003).

**Proposed Species**

*Gray wolf (Canis lupus)*

No construction or operational impacts are expected under Alternative 2, as described under Alternative 1.

**Forest Service Sensitive Wildlife Species**

*Peregrine falcon (Falco peregrinus)*

Due to the lack of occupation of the Bridger Range by breeding pairs, direct and indirect impacts to peregrine falcons as a result of the Proposed Action would be negligible. Peregrine falcons are occasionally seen using the Bridger Mountain flyway during fall migration. However, numbers of peregrines seen during this time are low relative to other raptor species. There is a potential for collisions with helicopters used for construction during the fall migration period (September-October). This issue is addressed in Table 2.6-1 in Chapter 2.

*Flammulated owl (Otus flammeolus)*

Dry, open Douglas fir types represent the majority of suitable flammulated owl habitat on the GNF. Approximately 0.4 acres of Douglas fir would be impacted under Alternative 2 (see Table 4.4-1). Prevailing east and north aspects in the Study Area produce little or no suitable flammulated owl habitat. Flammulated owls have been detected on the west side of the Bridger Range, approximately 12 miles from the Study area. Home ranges of flammulated owls, including nesting and foraging areas, are relatively small averaging about 35 acres for males and probably much smaller for females (USDA, 1994a). Therefore, it is unlikely that owls utilizing available habitat on the west side of the range would venture over to the east side (including the Study Area) in search of prey or other resources. Due to the lack of suitable habitat in the Study Area, direct, indirect and cumulative effects associated with the Proposed Action would be negligible. Therefore, there would be no direct or indirect effects or impact on flammulated owls under Alternative 2.

*Black-backed woodpecker (Picoides arcticus)*

Direct impacts to the potential habitat of black-backed woodpeckers would occur through the removal of hazard trees (snags, dead and diseased trees) from the vicinity of the newly cleared trails. Under Alternative 2, removal of trees for creation of ski trails, construction of lifts and the construction and relocation of roads would have indirect effects on potential future black-backed woodpecker habitat by further reducing the potential for fire in the Study Area (see Table 4.4-1). Fire suppression efforts within the ski area limit the potential for wildfire to create suitable black-backed woodpecker habitat. As there is currently no suitable habitat within the Study Area, impacts to black-backed woodpeckers under Alternative 2 would be negligible.

*Wolverine (Gulo gulo)*

Alternative 2 involves expansion to both the north and south of the existing ski area SUP boundary. It is important to note that the analysis for wolverine in this document discusses impacts to wolverine at the Study Area scale as well as the Wolverine Analysis Area scale. The Study Area consists of the existing SUP area and the northern and southern expansion areas (approximately 2,574 acres, see Figure 2-3). The Wolverine Analysis Area, as described in Section 3.5, consists of an area roughly the size of the average home range for a female with young (approximately 34,418 acres). The Wolverine Analysis Area is depicted in Figure 3-6.

Direct effects of this alternative include habitat alteration and removal. Timber harvest proposed in the north expansion area is scheduled to occur in winter and would overlap with the wolverine denning season which could result in displacement and mortality of individuals. Under the Proposed Action, a total of approximately 276 acres of wolverine denning habitat would be impacted in the expanded ski area boundary, which equates to approximately 10.6 percent of the denning habitat available in the Wolverine Analysis Area (see Table 4.5-2).

Indirect impacts due to implementation of the Proposed Action would include the fragmentation of a portion of the largest remaining block of mature and old growth forest in the southeast Bridgers (see Figure 4-4) (Novak, 2003). Forest fragmentation can affect wolverines by breaking up security habitat, and facilitating increased competition for prey from more generalist predators. High levels of forest fragmentation could compromise the integrity of the travel corridor currently provided on the east side of the Bridger Range. Forested habitat is still largely intact on the west side of the range and could continue to provide a relatively secure travel route.

Additional indirect impacts to wolverines would include snow compaction through trail grooming and skiing. Snow compaction could preclude snow tunneling often associated with wolverine natal dens and resting areas. In addition, the wolverine's large foot size relative to body size gives it a competitive advantage over other predators and scavengers in deep snow conditions (Banci 1994). Snow compaction could reduce this advantage. Finally, noise, disturbance, and increased human activity in the expansion areas due to

both construction and ski area operation would lead to avoidance of the area and possible abandonment of dens.

Alternative 2 would impact the largest amount of wolverine habitat of all the Action Alternatives. Denning habitat would be affected in both expansion areas, and a large block of security habitat within the northern expansion area would be permanently altered. Wolverines in the Bridger Range are part of a larger population that is considered healthy and viable by Montana Fish, Wildlife and Parks personnel (Pers. Comm. B. Giddings, K. Ault). However, wolverines normally occur in low densities, and additional impacts to their habitat could potentially have detrimental effects to resident populations. However, regular use of the area may already be limited by the high level of human activity in the Study Area during the winter. Summertime use of the Study Area is limited to hiking on established trails as can be seen in Figure 2-3, therefore human activity outside of winter is typically low to moderate. For these reasons, the Proposed Action may impact individual wolverines and their habitat.

Table 4.5-2 summarizes direct and indirect impacts, by alternative, to denning habitat within the wolverine analysis area.

**Table 4.5-2**  
**Impacts to Wolverine Denning Habitat\* within the Study Area**

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Direct (acres<sup>1</sup>)</b>	0	35.5	32.1	5.1
<b>Indirect (acres<sup>1</sup>)</b>	0	240.5	169.9	68.9
<b>Total Impact (acres<sup>1</sup>)</b>	0	276.0	202.0	74.0

\*Denning habitat includes mature forest, old growth forest, and talus within the Study Area.

<sup>1</sup> Area totals may not agree precisely with the Study Area size of 2,574 acres due to rounding.

Road and trail densities affect wolverines indirectly by facilitating human access, which can then have disturbance and/or displacement effects, or result in direct mortality of wolverines. Human presence can affect wolverine behavior patterns, and can potentially influence prey distribution. Road density figures were calculated for the Wolverine Analysis Area (compartments 504 and 515, plus subcompartments 04, 05, 06 and 07 of compartment 503). Table 4.5-3 summarizes increases in road density increases by alternative.



**Table 4.5-3**  
**Summary of New Road Construction and Road Density for the**  
**Proposed Action in the Wolverine Analysis Area**

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Length of Road (miles)</b>	52.8	54.6	53.9	53.9
<b>Road Density (mile/mile<sup>2</sup>)</b>	0.96	0.99	0.98	0.98

Alternative 2 would result approximately 1.8 miles of new roads within the Study Area; the greatest increase in road density of all the Action Alternatives. Several of these roads would double as ski trails during the winter ski season and some roads are concentrated in previously developed areas (see Figure 2-3).

*Northern goshawk (Accipiter gentilis)*

Habitat within the proposed expansion areas is comprised of mature and old growth Douglas fir, lodgepole pine, spruce, and subalpine fir. No goshawks were detected in surveys in 1996 and 2000 (USFS 2000). However, dispersing individuals may colonize the area in the future, making the amount of suitable available habitat an important component of the Study Area. Under Alternative 2, approximately 43.2 acres of goshawk nesting and foraging habitat would be removed within the Study Area (see Table 4.5-1).

Direct impacts to habitat would result from the removal of trees for the creation of ski trails and/or road and lift construction which would reduce suitable nesting habitat for goshawks in the Bridger Range. Indirect effects on foraging habitat would occur through removal of trees, snags, brush and/or down woody debris, which many of the goshawk's prey species utilize for nesting, foraging and security. In addition, goshawks are known to be sensitive to human activity and disturbance, especially during breeding and nesting (June-August). Increased human activity within the Study Area would likely cause goshawk to seek suitable nesting habitat in another location away from noise and disturbance. Goshawks are also known to occasionally use the thermal air currents produced by the Bridger Range. There is potential for direct mortality due to collisions with aircraft used during the construction phases of the proposed expansion. This issue is addressed in Table 2.6-1.

*Western big-eared bat (Corynorhinus townsendi)*

Impacts to western big-eared bats would be limited under Alternative 2 due to the lack of caves in the Study Area. Quality summer roosting habitat is available in the northern expansion area in mature and old growth forests. Approximately 27.6 acres of mature and old growth forest would be directly impacted as trees are removed for lift, trail and road construction (see Table 4.5-1). However, the trees removed for the project comprise only a miniscule proportion of potential summer roosting habitat available for bats in the Bridger Range. Additional direct effects would include loss of foraging habitat in riparian areas as trails are managed for vegetative growth. Mitigation measure RP-1,

which is designed to minimize adverse effects on riparian areas, would add a measure of protection to the foraging habitat of the western big-eared bat (see Table 2.6-1).

Indirect effects would result from the clearing of trees which could produce short-term improvements in foraging habitat for western big-eared bats, as this species is known to feed along forest edges (Clark et al., 1993; Freeman, 1984), which would be increased through the clearing of trees. However, the lepidopteran insects upon which the western big-eared bat feeds almost exclusively reproduce in shrubs and trees and not in grasses. Conversion of native vegetation (e.g., trees and shrubs) to grasses and rock surfaces through lift and trail construction and maintenance, and construction of new road surfaces would result in a reduction of potential foraging habitat for the western big-eared bat.

#### *Northern leopard frog (Rana pipiens)*

Impacts to northern leopard frog habitat would occur in the northern expansion area where suitable habitat exists in the form of seeps and wetlands (see Figure 4-2). Approximately 0.48 acres of wetlands would be impacted under the Proposed Action (see Table 4.3-2). Impacts to wetlands would consist of hand clearing of vegetation and no mechanical equipment would be used. Construction activities of all types may cause increases in sedimentation to seeps and wetlands. Mitigation measures proposed in Table 2.6-1 would help offset these impacts and implementation of BMPs would protect streams and wetlands from sedimentation and erosion. Direct mortality of individuals could occur during construction, especially during summer when the northern leopard frog is known to move upland from aquatic habitats. Impacts due to wintertime operation of the ski area are not expected to impact this species as its habitat would be located under several feet of snow.

Indirect impacts would result from the fragmentation of forest, which would create edges that the frog may be unwilling or unable to cross without sufficient cover. The northern leopard frog is not expected to reside within the Study Area due to the lack of documented presence as well as the high elevation of habitat (above 6500 feet); however, this does not preclude the likelihood of occasional presence of this species.

#### *Boreal toad (Bufo boreas boreas)*

Although no boreal toads have been identified within the Study Area, potential impacts to their habitat will be discussed because suitable habitat is available and the Study Area is within the range of this species. Distribution of the boreal toad is restricted to areas with suitable breeding habitat in spruce-fir forests and alpine meadows. Breeding habitat includes lakes, marshes, ponds, and bogs with sunny exposures and quiet, shallow water (CDOW World Wide Web 2004). The boreal toad is also known to occupy sagebrush meadows and forested areas outside of the breeding season which occurs from approximately May to late July. The northern expansion area provides suitable habitat for this species. Direct impacts to the suitable boreal toad habitat would include mortality of individuals during construction and maintenance in the late summer months. In addition, disturbance of breeding individuals as well as mortality to eggs could occur during clearing in wetland areas.

Indirect impacts would result from the fragmentation of forest, which would create edges that the frog may be unwilling or unable to cross without sufficient cover. Mitigation measure W-5 would require pre-construction surveys for boreal toads to prevent impacts to this species (see Table 2.6-1).

### **Management Indicator Species**

#### *Pine marten (Martes americana)*

Impacts associated with Alternative 2 would degrade suitable denning habitat including subalpine fir, spruce, and lodgepole pine forests in the northern expansion area due to construction of ski lifts, trails, and roads. Direct impacts would include the removal of 43.2 acres of mature and old growth forested habitat, potentially destroying existing denning sites (see Table 4.5-1). The clearing of forest for ski trails would also result in forest fragmentation in the relatively undisturbed northern expansion area. Some fragmentation would also occur within the southern expansion area however, this area is naturally more open and the fragmentation of larger stands of mixed conifer forest would be significantly less than in the northern area.

Indirect impacts would include the reduction of potential denning material, such as down wood. Additional indirect impacts would result from construction activities causing noise and increased human activity which could cause temporary disturbance and displacement of pine martens utilizing the Study Area. Increased human activity associated with the new ski trails would have a similar effect as martens would most likely relocate to more undisturbed locations. Additionally, indirect impacts would occur from the expansion of the ski terrain which would result in additional snow compaction and the potential reduction in availability of subnivean prey sources.

#### *Migratory birds*

Under Alternative 2, impacts to migratory bird species would result from activities and vegetation alteration associated with the renovation of existing lifts, construction of new lifts, building of roads, and development of new ski runs. The proposed development in the north expansion area would require the clearing of mature and old growth forest to create new ski trails, and possibly some clearing of debris along the edges of the new runs (see Table 4.4-1, Figure 4-4). Proposed development and improvements within the existing SUP boundary and in the south expansion area would require some timber harvest and other vegetation manipulation, but for the most part would involve selective tree cutting in open habitat or small patches of trees. However, ski trails S5 and S4 traverse forested blocks and would require more extensive tree removal than development in the more open habitat within the south expansion area. Further, ski trails S5 and S3 cross through riparian habitat in the Slushman drainage. Riparian areas contain preferred nesting habitat for numerous bird species. Mitigation measure RP-1, which is designed to minimize adverse effects to riparian areas, would confer some protection to riparian dwelling species.

Direct effects of the Proposed Action include disturbance and/or displacement of nesting birds in the vicinity of construction. If timber harvest and subsequent construction activities occur in the spring or early summer, there is the possibility of nest abandonment, nestling mortality and resulting nest failure if snags, trees or shrubs with occupied nests are disturbed or removed. Birds in ground nests could be displaced by construction activities, and eggs or chicks might be crushed by equipment or falling trees.

Indirect effects of the proposal would result from fragmentation of forest interior habitat. Proposed development to the north involves cutting five ski trails (trails N2, N3, N4, N5, and N8) through a portion of the largest remaining patch of intact mature and old growth contiguous forest in the southeast Bridgers (see Figure 4-4) (Novak, 2003). Fragmentation of this sort would have adverse impacts on forest interior nesting birds such as the brown creeper, winter wren, golden-crowned kinglet and hermit thrush, which are relatively restricted to uncut forest habitats (Hutto and Young, 1999). Forest fragmentation can benefit habitat generalists or edge specialists such as mammalian and avian nest predators that feed on eggs and young of birds, and brood parasites that lay their eggs in the nests of other birds. Increased presence of these species is deleterious to forest interior birds, since predation, parasitism, interspecific competition and other environmental effects can collectively result in reduced nest success (Faaborg et al., 1992). The extent of edge effects can vary by habitat type, and have been estimated by various authors as ranging between 160 and 2,000 feet. Harris (1984) refers to the "three-tree-height" rule of thumb for estimating edge effects. Assuming an average tree height of roughly 54 feet, edge effects would extend 160 feet into remaining strips of forest habitat between ski runs. Forest strips with clearings on either side would have to be greater than 328 feet wide to provide habitat without negative edge effects. Forested strips remaining after development of proposed lifts, runs and road in the north expansion area would be between approximately 150 to 200 feet wide at their smallest and approximately 600 feet at their widest.

#### *Game birds and mammals*

##### Blue Grouse, Ruffed Grouse

Under Alternative 2, the potential effects to the blue grouse (*Dendragapus obscurus*) include removal and/or degradation of nesting habitat through vegetation manipulation planned for the expansion, disturbance/displacement of nesting grouse due to construction activities (see Figure 2-3), resulting in possible nest abandonment and/or chick mortality, and removal of hiding cover, making game birds more vulnerable to predation and hunting mortality.

The ruffed grouse (*Bonasa umbellus*), being primarily associated with aspen stands, would not likely be affected by the Proposed Action as there are no impacts to aspen within the Study Area (see Table 4.4-1).

### Elk, Mule deer, White-tailed deer, Moose, Mountain goat

The Study Area provides high quality summer and fall range for elk (*Cervus elaphus*), and mule deer (*Odocoileus hemionus*), year-round habitat for moose (*Alces alces*), and possibly wintering habitat for mountain goat (*Oreamnos americanus*) (Pac, Pers. Comm., 1996). Mule deer use of the SUP area is generally seasonal, with highest use occurring in summer and fall. The Study Area provides good habitat and mule deer use was prominent during field surveys (Pac, Mackie, Jorgensen, 1991). Deer fawning may occur within the SUP area depending on the amount of snow remaining during the fawning season (May – July). White-tailed deer (*Odocoileus virginianus*) generally frequent lower elevations and are not expected to occur regularly within the Study Area. Key habitat for moose is composed of dense subalpine-fir and associated shrubby riparian areas which provide foraging vegetation.

Vegetation types in the Study Area can be roughly divided into potential foraging habitat and potential cover habitat. Cover includes both thermal cover for body temperature regulation and hiding cover (Thomas and Toweill, 1982). Under Alternative 2 there would be a permanent loss of cover habitat in the forested northern and southern expansion areas; a loss of approximately 43.2 acres. Large ungulate habitat would be altered by a permanent loss of cover habitat as forested areas are cleared for ski trails, and roads and buildings (such as lift terminals) (see Table 4.4-1). New ski trails would be maintained in a managed shrub/herbaceous condition, providing suitable foraging habitat for elk, deer, and moose.

Permanent impacts to moose, which are found in the Study Area year round, would include displacement of individuals that may be utilizing the forested areas in the northern expansion area for cover and security. Moose would most likely move away from the increased human activity to quieter, more isolated locations.

Permanent habitat conversion would occur in areas not currently receiving high human use. This conversion would result in an increased amount of edge habitat, an increase in potential foraging habitat, and a decrease in cover. The effectiveness of edge as foraging habitat would be affected by the amount and treatment of slash created during trail construction. Slash left piled along newly constructed ski trails could obstruct ungulate movement and limit use of the new areas. Removing or reducing the slash or creating cleared access trails between the new ski trails and the surrounding forest would reduce impacts.

Indirect impacts to big game include potential disturbance and/or displacement of moose, elk, and deer during calving/fawning season due to construction activities and recreation. Security cover would be reduced as trees, shrubs and brush are removed, increasing ungulate vulnerability to predation and hunting mortality. Although habitat alteration and increased human activity would result from the Proposed Action, suitable habitat would remain available within the SUP area.



## Road Density

Road densities are of concern to elk habitat management because motorized use of roads can produce disturbance effects that result in their displacement. Effective elk security cover is modified by open roads. The greater the density of open roads within an area, the less effective is hiding cover in providing security for elk (USDA 1987). Montana Fish, Wildlife, and Parks (FWP) recommends that the Forest Service manage for an open road density of one mile or less per square mile of habitat to be consistent with the Elk Management Plan guidelines (IGBC 2003).

The Gallatin Forest Plan contains a forest-wide standard that effective habitat ratings of at least 70 percent should be maintained for timber sale and road construction activities (USDA 1987). The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. An HEI rating of 0.70 is the minimum allowed to meet the Forest Plan standard. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and generally encompass an area representative of elk summer range.

The Proposed Action includes timber compartments 504 and 515. Table 4.5-4 displays the changes to road miles, road density, and elk HEI. Compartment 504 currently has an open road density of approximately 1.64 miles per square mile, which equates to an HEI of 0.54. Compartment 515 currently has an open road density of approximately 1.96 miles per square mile, which equates to an HEI of 0.50. The HEIs for timber compartments 504 and 515 are below the minimum standard of 0.70 established in the Forest Plan. Under Alternative 2, the road density within the compartment 504 would increase to 1.78 miles per square mile, an increase of approximately 0.14 miles per square mile. The HEI for Compartment 504 would be reduced from 0.54 to 0.52, pushing the HEI further out of compliance with the Forest Plan (see Table 4.5-4). The road density within compartment 515 would not increase from 1.96 miles per square mile therefore the HEI for Compartment 515 would remain the same as Alternative 1 (see Table 4.5-4).

Therefore, while road density would increase within the Study Area, it is not enough to alter the current HEI for compartment 504 or 515.

**Table 4.5-4**  
**Changes Road Miles, Road Density, and Elk HEI by Alternative**

Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4
<b>Total Road Miles in C-504</b>	19.8	21.6	20.9	20.9
<b>Road Density in C-504</b>	1.64	1.78	1.73	1.73
<b>Elk HEI in C-504</b>	0.54	0.52	0.53	0.53
<b>Total Road Miles in C-515</b>	32.5	32.5	32.5	32.5
<b>Road Density in C-515</b>	1.96	1.96	1.96	1.96
<b>Elk HEI in C-515</b>	0.50	0.50	0.50	0.50

Black bear, Mountain lion

Black bear (*Ursus americanus*) are likely to use the habitat within the Study Area in spring for lush vegetation and in the fall for pine nuts and animal remains from hunter kills. Black bears are habitat generalists so the entire SUP currently in vegetation can be considered habitat. The Proposed Action would increase the likelihood of human-bear interactions; however, since the vast majority of human use would occur during the bears' denning period, the increased potential for conflict is minor. Mitigation measures designed to reduce the availability of garbage around the base area would aid in reducing potential human-bear interactions (see Table 2.6-1). Clearing of forest for ski trails could actually improve the habitat value of these areas by increasing the quantity of berry-producing shrubs between maintenance. In addition, cleared ski trails would increase foraging habitat for large ungulates, attracting more browsers to the Study Area during the summer and fall seasons and providing the black bear with an increased abundance in prey. However, security cover would be reduced and the increased fragmentation of forest habitat in the Study Area could hamper normal black bear movement.

Mountain lions (*Felis concolor*) most likely use the Study Area in association with the presence of ungulates. The Study Area provides winter habitat only for moose while other big game species such as deer and elk move to lower elevations. Potential direct impacts to mountain lions include alteration of habitat, alteration in prey availability, and disturbance as a result of construction activities. The conversion of forested areas to shrub and herbaceous habitats for ski trail development may increase the suitable habitat for deer and elk and thus may improve the foraging value of the Study Area for mountain lions in the summertime. In contrast, the reduction of forest cover for new or wider ski trails could disrupt the normal movement patterns of mountain lions and discourage their use of the area. Mountain lions generally avoid areas of human activity, so construction of project components is likely to repel cougars that would normally use the Study Area. Summertime maintenance of trails and lifts would be infrequent but could alter use of the area by deer and elk, the mountain lion's primary prey. In addition, recreational activity

could impact use of the area by mountain lion although summertime use of the Study Area would be limited so this would be a minor impact.

### **Other Species of Interest**

#### *Boreal owl (Aegolius funereus)*

Under Alternative 2, direct impacts to suitable boreal owl habitat would occur as trees are cleared for the creation of ski trails, construction of lifts and construction and the relocation of roads. Some large trees and snags within boreal owl nesting habitat would be removed under Alternative 2 (see Table 4.4-1). Indirect impacts would occur as a result of snow compaction and its associated impacts to small mammal populations, which comprise the majority of the boreal owl's diet. Survey efforts by Brelsford (1992) in Pine Creek and Slushman Creek drainage failed to detect boreal owl presence in the Bridger Range. However, the limited nature of this survey and lack of surveys elsewhere in the Bridger Mountains leaves the presence of boreal owls in the Study Area unknown. Although the Proposed Action would alter boreal owl habitat, Region-wide surveys have indicated that this species is more common than believed when it was listed as "sensitive". Based on multi-year survey results, the boreal owl was removed from the Northern Region Sensitive Species list in March 1999 (USFS 1999).

#### 4.5.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

### **Management Area Designation Change**

Under Alternative 3, the effects of MA change would be similar to Alternative 2, but would only involve the change in MA 12; e.g., 217.3 acres converted to MA 2.

### **Threatened Species**

#### *Canada lynx (Lynx canadensis)*

##### Denning Habitat

Alternative 3 would have similar effects on lynx denning habitat, except that there would be no development in the south expansion area. Proposed expansion to the north would remove approximately 27.6 acres of mature and old growth forest and indirectly impact approximately 193.54 acres (see Table 4.5-1). Alternative 3 would impact fewer acres than the Proposed Action.

##### Foraging Habitat

Alternative 3 would have the same direct and indirect effects on foraging habitat as Alternative 2, but would affect only the area within the existing SUP and the north expansion area, and thus a slightly smaller proportion of foraging habitat would be impacted. No impacts to immature lodgepole pine forest, which is the primary foraging habitat of lynx, would occur under Alternative 3. Indirect effects would be similar to those described for Alternative 2.

## Connectivity

Alternative 3, with development in the existing SUP boundary and north expansion area, would have the same impacts to the large block of continuous mature forest in the LAU as Alternative 2, but the smaller patch of mature forest in the south expansion area would not be affected. Indirect effects would be similar to those described for Alternative 2.

### *Bald eagle (Haliaeetus leucocephalus)*

Impacts to Bald Eagle under Alternative 3 would be as described under Alternative 2.

## **Proposed Species**

### *Gray wolf (Canis lupus)*

No construction or operational impacts to gray wolf are expected under Alternative 3, as described under Alternative 2.

## **Forest Service Sensitive Wildlife Species**

### *Peregrine falcon (Falco peregrinus)*

Impacts to peregrine falcons under Alternative 3 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south, and therefore, fewer impacts overall.

### *Flammulated owl (Otus flammeolus)*

Impacts to flammulated owl under Alternative 3 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south.

### *Black-backed woodpecker (Picoides arcticus)*

Impacts to black-backed woodpecker under Alternative 3 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south, and therefore, fewer impacts overall.

### *Wolverine (Gulo gulo)*

Alternative 3 involves ski area expansion to the north, but not to the south of the existing SUP boundary. Direct and indirect effects to wolverines under this alternative would be similar to those described for Alternative 2, since the higher quality wolverine habitat is located in the north expansion area. Under this alternative, approximately 202 acres of wolverine denning habitat would be impacted in the new ski area boundary, which equates to about 7.8 percent of the denning habitat available in the Wolverine Analysis Area (see Table 4.5-2). Approximately 1.1 miles of new road would be constructed with

this alternative, bringing road density in the Wolverine Analysis Area to 0.98 miles per square mile, slightly less than the Proposed Action.

*Northern goshawk (Accipiter gentilis)*

Under Alternative 3 approximately 40.2 acres of nesting and foraging habitat would be removed (see Table 4.5-1; Figure 2-3). Direct and indirect effects to goshawks associated with the removal of nesting and foraging habitat would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south.

*Western big-eared bat (Corynorhinus townsendi)*

Impacts to the western big-eared bat under Alternative 3 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south.

*Northern leopard frog (Rana pipiens)*

Because the southern expansion area does not contain suitable habitat for the northern leopard frog, potential impacts to this species would be as described for the northern expansion area under Alternative 2.

*Boreal toad (Bufo boreas boreas)*

Because the southern expansion area does not contain suitable habitat for the boreal toad, potential impacts to this species would be as described for the northern expansion area under Alternative 2.

**Management Indicator Species**

*Pine marten (Martes americana)*

Alternative 3 would impact approximately 27.6 acres of suitable pine marten habitat in the northern expansion area (see Table 4.5-1). This area provides high quality marten habitat in the form of mature and old growth subalpine fir and lodgepole pine forests with north and northeast aspects (see Table 4.4-1; Figure 4-4). Impacts under Alternative 3 would be as described under Alternative 2 with the exception that there would be no development in the southern expansion area.

*Migratory birds*

Under Alternative 3, effects to migratory bird species would be comparable to those listed for Alternative 2, but would occur only within the existing SUP area and in the north expansion area; i.e., under this alternative, no expansion, no development, and hence no impacts would occur to the south of the existing SUP area (see Table 4.4-1). Proposed expansion to the north involves considerably more habitat alteration than development within the existing boundary or to the south. The north expansion area has by far the greatest amount of forest interior habitat that could be affected by the proposed



action, therefore direct and indirect effects of Alternative 3 would be similar to Alternative 2 for forest interior migratory bird species. Mitigation measure RP-1, which is designed to minimize adverse effects on riparian areas, would aid in the protection of habitat and individuals (see Table 2.6-1).

#### *Game birds and mammals*

##### Blue and Ruffed grouse (*Dendragapus obscurus*, *Bonasa umbellus*)

Impacts to blue grouse under Alternative 3 would be similar but less than those described for Alternative 2 because there would be no development in the proposed southern expansion area.

No impacts to ruffed grouse are expected to occur under Alternative 3 as there would be no impacts to its primary habitat, quaking aspen (see Table 4.4-1).

##### Elk, Mule deer, White-tailed deer, Moose, Mountain goat

Impacts to elk, mule deer, white-tailed deer, moose, and mountain goat under Alternative 3 would be similar but less than those described for Alternative 2 because there would be no development in the proposed southern expansion area.

##### Road Density

Under Alternative 3, the road density for Compartment 504 would be approximately 1.73 miles/miles<sup>2</sup>, an increase of 0.09 miles/miles<sup>2</sup> over existing conditions (see Table 4.5-4). The road density for Compartment 515 would not increase over existing conditions. Alternative 3 would not alter the elk Habitat Effectiveness Index for Compartment 515. The HEI for Compartment 504 would be reduced from 0.54 to 0.53, pushing the HEI further out of compliance with the Forest Plan (see Table 4.5-4).

##### Black bear, Cougar

Impacts to black bear and cougar under Alternative 3 would be similar but less than those described for Alternative 2 because there would be no development in the proposed southern expansion area.

#### **Other Species of Interest**

##### *Boreal owl (*Aegolius funereus*)*

Impacts to boreal owl under Alternative 3 would be the same as Alternative 2 with the exception that there would be no expansion of the SUP boundary to the south.

#### 4.5.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

##### **Management Area Designation Change**

Under Alternative 4, the effects of MA change would be the same as under Alternative 2, but would only involve the change in MA 11; e.g., approximately 16.7 acres converted to MA 2.

##### **Threatened Species**

*Canada lynx (Lynx canadensis)*

###### Denning Habitat

Alternative 4 would have considerably less impact on lynx denning habitat, with approximately 2.9 acres of mature and old growth mixed conifer forest that would be directly impacted by the development of ski runs in the southern expansion area. None of the higher quality denning habitat north of the existing ski area SUP would be affected under this alternative. The impacts to denning habitat from development in the south expansion area would reduce the total proportion for the LAU by 0.11 percent from the 22 percent currently available.

###### Foraging Habitat

Alternative 4 would impact approximately 0.3 acres of immature Douglas fir forest in the south expansion area. There would be no removal of immature lodgepole pine in this alternative. Direct effects of this alternative would impact less foraging habitat than under either alternatives 2 or 3. The relatively small impacts to forested habitat in the southern expansion area would result in fewer effects to lynx foraging habitat than alternatives 2 or 3.

###### Connectivity

Alternative 4 would have some fragmentation effects on a smaller patch of mature forest located in the south expansion area, but would not disturb the large block of mature and old growth habitat in the northern expansion area. Indirect effects would still result from the permanent habitat alteration of mature forest in the south expansion area, but would be to a lesser extent than with either alternatives 2 or 3, since less mature forest and a smaller patch of continuous forest would be impacted.

*Bald eagle (Haliaeetus leucocephalus)*

Impacts to Bald Eagle under Alternative 4 would be similar to those describe under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north.

## **Proposed Species**

### *Gray wolf (Canis lupus)*

No construction or operational impacts are expected under Alternative 4, as described under Alternative 1.

## **Forest Service Sensitive Wildlife Species**

### *Peregrine falcon (Falco peregrinus)*

Impacts to peregrine falcons under Alternative 4 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north, and therefore, fewer impacts overall.

### *Flammulated owl (Otus flammeolus)*

Impacts to flammulated owl under Alternative 4 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north, and therefore, fewer impacts overall.

### *Black-backed woodpecker (Picoides arcticus)*

Impacts to black-backed woodpecker under Alternative 4 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north, and therefore, fewer impacts overall.

### *Wolverine (Gulo gulo)*

Alternative 4 involves ski area expansion to the south, but not to the north of the existing SUP boundary. Direct and indirect effects to wolverines under this alternative would be similar to those described for Alternative 2, however, since the higher quality wolverine habitat is located in the north expansion area, fewer impacts overall would be expected. Under this alternative, approximately 74 acres of wolverine denning habitat would be impacted in the new ski area boundary, which equates to about 2.9 percent of the denning habitat available in the wolverine analysis area. Approximately 1.1 miles of new road would be constructed with this alternative, bringing road density in the Study Area to 0.98 miles per square mile, slightly less than the Proposed Action.

### *Northern goshawk (Accipiter gentilis)*

Under Alternative 4 approximately 7.7 acres of nesting and foraging habitat would be removed (see Table 4.5-1; Figure 2-3). Direct and indirect effects to goshawks associated with the removal of nesting and foraging habitat would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north.

*Western big-eared bat (Corynorhinus townsendi)*

Impacts to the western big-eared bat under Alternative 4 would be similar to those described under Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north, and therefore, fewer impacts overall.

*Northern leopard frog (Rana pipiens)*

Because the southern expansion area does not contain suitable habitat for the northern leopard frog, there would be no impacts to this species under Alternative 4.

*Boreal toad (Bufo boreas boreas)*

Because the southern expansion area does not contain suitable habitat for the boreal toad, there would be no impacts to this species under Alternative 4.

**Management Indicator Species**

*Pine marten (Martes americana)*

Alternative 4 would impact approximately 2.9 acres of suitable pine marten habitat in the southern expansion area (see Table 4.5-1). This area provides only marginal marten habitat in the form of mature Douglas fir and mixed conifer forests with east and southeast aspects. There would be fewer direct and indirect impacts under Alternative 4 than those disclosed for alternatives 2 and 3, as only a small portion of marginal habitat would be affected; leaving the quality habitat in the northern expansion area undisturbed.

*Migratory birds*

Under Alternative 4, effects to migratory bird species would occur only within the existing SUP boundary and in the south expansion area; and hence no impacts would occur to the north of the existing SUP area. Development in the existing area and to the south involves mainly non-forest and sparsely forested habitat, therefore there would be little habitat disturbance and effects would be primarily limited to the direct impacts associated with initial construction activities. Mitigation measure RP-1, which is designed to minimize adverse effects on riparian areas, would aid in the protection of habitat and individuals (see Table 2.6-1).

**Game birds and mammals**

*Blue and Ruffed grouse (Dendragapus obscurus, Bonasa umbellus)*

Impacts to blue grouse under Alternative 4 would be similar but less than those described for alternatives 2 and 3 because there would be no development in the proposed northern expansion area.

No impacts to ruffed grouse are expected to occur under Alternative 4 as there would be no impacts to its primary habitat; quaking aspen (see Table 4.4-1).

*Elk, Mule deer, White-tailed deer, Moose, Mountain goat*

Impacts to elk, mule deer, white-tailed deer, moose, and mountain goat under Alternative 4 would be similar but less than those described for alternatives 2 and 3 because there would be no development in the proposed northern expansion area.

*Black bear, Cougar*

Impacts to black bear and cougar under Alternative 4 would be similar but less than those described for alternatives 2 and 3 because there would be no development in the proposed northern expansion area.

*Road Density*

Under Alternative 4, the road density for Compartment 504 would be approximately 1.73 miles/miles<sup>2</sup>, an increase of 0.09 miles/miles<sup>2</sup> over existing conditions (see Table 4.5-4). The road density for Compartment 515 would not increase over existing conditions. Alternative 4 would not alter the elk Habitat Effectiveness Index for Compartment 515. The HEI for Compartment 504 would be reduced from 0.54 to 0.53, pushing the HEI further out of compliance with the Forest Plan (see Table 4.5-4).

**Other Species of Interest**

*Boreal owl (Aegolius funereus)*

Impacts to boreal owl under Alternative 4 would be the same as Alternative 2 with the exception that there would be no expansion of the SUP boundary to the north. Since the southern expansion area contains marginal boreal owl nesting habitat impacts are expected to be negligible.

**4.5.5 FOREST PLAN CONSISTENCY**

Under the current Forest Plan Management Area (MA) designation, development associated with ski area expansion to the north would be inconsistent with the MA 12 primary goal to maintain and improve the vegetative condition to provide habitat for a diversity of wildlife species. The Proposed Action includes a Forest Plan amendment to change the MA designation in the northwest expansion area from MA 12 (important habitat for wildlife) to MA 2 (Developed Ski Area) (see Chapter 2 and Appendix C). In addition, a small amount of MA 11 (big game emphasis) would be added to the ski area boundary in the southeast corner. The Proposed Action also included a Forest Plan amendment to change this small parcel designation from MA 11 to MA 2. No vegetation changes are proposed within this small parcel, and the area would continue to provide forested big game habitat. The proposed Forest Plan amendments to shift management area designation as described would make the Proposed Action consistent with the Forest Plan.

The Forest Plan contains a forest-wide standard to analyze elk habitat security as it is affected by timber harvest and road construction activities in accordance with the 1982



Elk Logging Study Annual Report, and to maintain an elk habitat effectiveness index (HEI) of at least 0.70 (USDA 1987). Since the proposed action involves both timber harvest and road construction, HEI calculations were evaluated for affected timber compartments (504 and 515). Both compartments are currently below Forest Plan standard, with HEI values of 0.54 and 0.50 respectively. New road construction associated with the proposed action would further reduce HEI in compartment 504. The Proposed Action includes a site-specific amendment to the Forest Plan to exempt the project from meeting the Forest Plan standard for HEI in Timber Compartment 504.

## 4.6 FISHERIES

In order to analyze potential downstream impacts to fish habitat, annual sediment yields were calculated by the GNF hydrologist (Story, 2003) for the existing conditions and proposed activities in alternatives 2, 3, and 4 using the R1/R4 sediment model (Cline et al., 1981). The scale of the area modeled for sediment impacts used to support for fisheries analysis is the SF Brackett Creek Watershed and the Upper Bridger Creek Watershed. For the purpose of this analysis, the Upper Bridger Creek Watershed includes Upper Bridger Creek, Maynard Creek, and Slushman Creek. The actual effects of additional delivery of fine sediment on fish habitat quality would be dependent on precipitation, streamflow, how quickly exposed soil is stabilized, and how the sediment is delivered to and routed within the stream during these activities. The effects of this additional sediment delivery on fish spawning and rearing habitat was estimated using a modification of the Fish/Sediment model which estimate changes in substrate composition that results from changes in sediment delivery rates (Stowell et al., 1983). This modification more accurately reflects sediment routing relationships of geologies found on the GNF.

### 4.6.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1

There would be no change to the existing condition of fish habitat quality or quantity within the Upper Bridger Creek and SF Brackett Creek watersheds under Alternative 1 because no activities are proposed. According to the 1999 MOU discussed in Chapter 3, the GNF sediment guideline for streams with sensitive fish species is to maintain aquatic habitat at or above 90 percent of optimum conditions. Guidance from the GNF for assessing compliance with this guideline is to ensure that sediment delivery to streams does not exceed 30 percent over natural conditions on an annual basis. The modeled sediment delivery rate to SF Brackett Creek for existing conditions is 8.2 percent over natural conditions for SF Brackett Creek, which is well below 30 percent threshold set by the GNF to ensure that habitat is maintained at 90 percent of optimum conditions. Based on guidance in the 1999 MOU, Alternative 1 would not have any significant effects on Yellowstone cutthroat trout or their habitat in SF Brackett Creek because Alternative 1 would not change sediment yields to SF Brackett Creek and it meets the guidance of the 1999 MOU.

No populations of westslope cutthroat trout or Artic grayling have been documented in the Upper Bridger Creek or SF Brackett Creek watersheds, but habitat for westslope cutthroat trout is present downstream of Upper Bridger Creek. The three tributaries to the mainstem of Bridger Creek (Slushman, Maynard, and Upper Bridger) are all considered Class D streams by the GNF since they do not have any documented fish presence. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates. Alternative 1 would not have any direct impacts to special status fish populations in the Upper Bridger Creek watershed because no special status fish are present in the watershed and the alternative would not change sediment yield rates. According to estimates from the R1R4 model, the existing sediment yield to the three tributaries to the mainstem of Bridger Creek range from 8 to 77 percent above natural conditions. Alternative 1 would not have any significant effects

on westslope cutthroat trout habitat in Lower Bridger Creek because Alternative 1 would not change sediment yields, which are within the GNF standard for Class D streams

#### 4.6.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2

Potential direct effects from implementation of Alternative 2 include the mortality of fish or destruction of fish habitat, such as a fuel spill from construction equipment directly in SF Brackett or Upper Bridger Creeks that could affect downstream fish populations. The potential for this to occur is extremely low to non-existent as construction equipment would not be working immediately adjacent to streams. Any work within the Stream Management Zone (SMZ) would follow any applicable Mitigation measures listed in Chapter 2 (see Table 2.6-1) and BMPs listed in the Implementation and Monitoring Plan in Appendix D.

Indirect effects would be those resulting in changes to fish habitat due to changes in the physical environment, such as the potential for accelerated sediment delivery in the lower gradient stream reaches to affect the reproductive success of trout, see Section 4.2 – Soil Resources for more details on changes in sediment yield from the alternatives. Elevated levels of fine sediment (material < 6.3 mm in diameter) have been shown to affect salmonid habitat used for spawning, rearing, and overwintering (Chapman and McLeod, 1987). Pollution intolerant macroinvertebrate abundance, survival of embryos to emergence, pool volume, and quantity of overwintering habitat for salmonids are correlated with the level of fine sediment in streams (Chapman and McLeod, 1987). Accelerated sediment delivery is expected to increase approximately 1.5 to 3.9 percent over existing conditions during construction activities, however this rate would drop once construction was complete and trails were stabilized and is not expected to have significant effects to MIS or sensitive fish habitat (see Table 4.6-1).

##### **Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*)**

Direct impacts to the Yellowstone cutthroat trout are not expected to occur under Alternative 2 because no in-stream work is proposed in SF Brackett Creek and the potential for fuel spills into the waterbody is extremely low.

Maximum sediment delivery to SF Brackett Creek from summer road and ski trail construction proposed under Alternative 2 is estimated to increase sediment delivery rates to 10.1 percent over natural conditions, or 1.8 percent over existing rates (see Table 4.6-1). This delivery rate would decrease to 9.3 percent over natural conditions within 2 years after construction in 2007. This would translate to less than a 0.5 percent annual increase in fine sediment deposited within SF Brackett Creek during the years of implementation. This rate is estimated to fall to 0.2 percent over existing levels within two years. The cumulative rate of sediment deposition in 2011 is predicted to be less than 2 percent with no downstream routing being considered (see Table 4.6-1). This level of sediment deposition within SF Brackett Creek would have extremely limited, if any, negative effect on Yellowstone cutthroat trout habitat within the drainage. Furthermore, because sediment delivery to SF Brackett Creek would not exceed 30 percent over natural levels under Alternative 2, aquatic habitat would not likely be

degraded below 90 percent of optimum conditions. Based on the sediment modeling, Alternative 2 would not have any significant effects on Yellowstone cutthroat trout or their habitat in SF Brackett Creek because changes in sediment yields would comply with the guidance of the 1999 MOU.

**Table 4.6-1**  
**Existing and Estimated Annual Sediment Delivered**  
**to the South Fork Brackett Creek for Alternatives 2 and 3**

Watershed	Year	Sediment Yield Increase from Natural Rate (tons/year)	Total Combined Sediment Yield (tons/year)	Increase Over Natural Rates (percent)	Incremental Change in Percent Fines in Channel	
					Annual	Cumulative
Existing Conditions	2004	6.8	89.8	8.2	0.0	0.0
Implementation Alternatives 2 & 3	2005	8.4	91.4	10.1	0.4	0.4
	2006	7.9	90.9	9.5	0.3	0.7
	2007	7.7	90.7	9.3	0.2	0.9
	2008	7.6	90.6	9.2	0.2	1.1
	2009	7.2	90.2	8.7	0.1	1.2
	2010	7.1	90.1	8.6	0.1	1.3
	2011	7.0	90.0	8.4	0.0	1.3

\*Table based on implementation beginning in 2004. However actual implementation may vary.

Source: USFS

### **Westslope cutthroat trout (*Oncorhynchus lewisi*)**

Direct impacts to the westslope cutthroat trout are not expected to occur under Alternative 2 because the proposed culvert crossing in Slushman Creek is in a location with no documented fish presence or habitat and the potential for fuel spills into the waterbody is extremely low.

Suitable habitat for westslope cutthroat trout exists downstream of the Study Area within Bridger Creek. Development of ski trails and roads in the Study Area would further increase sedimentation into Bridger Creek drainage potentially reducing the quality of aquatic habitat if westslope cutthroat trout were to be reintroduced into this portion of their historic range. However, the maximum sediment delivery due to construction activities proposed under Alternative 2 is estimated to increase delivery rates in the three tributaries to the mainstem of Bridger Creek by 1.5 to 3.5 tons per year, increasing rates over natural conditions to 28.4 to 83.9 percent. Increases in sediment yield as a result of activities proposed under Alternative 2 would not exceed the 100 percent above natural rates guidelines of the GNF. Therefore, this level of sediment delivery and deposition within Upper Bridger Creek Watershed would have extremely limited, if any, negative effect on westslope cutthroat trout habitat.

### **Arctic grayling (*Thymallus arcticus*)**

The Proposed Action is not expected to impact the fluvial arctic grayling as no suitable habitat exists within the Study Area. In addition, there has been no documented presence of this species within the Bridger Creek drainage.

#### **4.6.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3**

Potential effects to Yellowstone cutthroat trout and Arctic grayling under the implementation of Alternative 3 would be the same as those described under Alternative 2. Potential effects to MIS and sensitive species (westslope cutthroat trout) habitat from Alternative 3 would be slightly less than under Alternative 2 because there would be no development in the Slushman drainage. Potential increases in sediment yields to Maynard and Upper Bridger Creeks would be the same as Alternative 2, which would be in compliance with GNF guidelines for Class D streams.

#### **4.6.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4**

Alternative 4 would not entail any development within the SF Brackett Creek watershed, therefore there would be no impacts to MIS or sensitive species (Yellowstone cutthroat trout) from increased sediment delivery rates or reduced biological productivity within the SF Brackett Creek watershed. Potential effects to MIS and sensitive species (westslope cutthroat trout and Arctic grayling) under the implementation of Alternative 4 would be the same as described under Alternative 2, although sediment delivery rates in Maynard Creek and Upper Bridger Creek would be slightly less than under Alternative 2.

#### **4.6.5 FOREST PLAN CONSISTENCY**

The Forest Plan identifies a goal associated with fish habitat management that is “to maintain and enhance fish habitat to provide for an increased fish population” (II-1). The plan further refines this direction by providing Forest Plan implementation guidelines that identify specific management requirements for various stream classes. SF Brackett Creek is classified as a Class A stream by the GNF due to the presence of sensitive fish species. Class A streams are to be managed at a level which provides at least 90 percent of their potential habitat capability. Based on inspections of fish habitat and riparian area conditions, along with current sediment delivery rate estimates, SF Brackett Creek currently provides habitat at a level greater than 90 percent capability requirement. Analysis of potential increases in sediment delivery rates due to implementation of the Proposed Action indicates that the 90 percent capacity requirement would be met, and therefore, the Proposed Action would be consistent with this Forest Plan Standard.

According to Standard 6.a.15 in the Forest Plan, any structures that are installed in fish-bearing streams shall be designed to allow for upstream fish passage. The one stream crossing that is included in the Proposed Action would occur on Slushman Creek near the point in the stream where it transitions from perennial flowing to intermittent. As disclosed in the Fisheries Section in Chapter 3 of this document, there is no documented presence of fish in Slushman Creek. Therefore, implementation of the Proposed Action would be consistent with this Forest Plan Standard (II-19).



## **4.7 ROADLESS**

The analysis of the action alternatives encompasses potential site-specific impacts, including those on the roadless characteristics and wilderness features, stemming from the implementation of the proposed management practices designed to achieve the goals and objectives associated with non-wilderness management.

### **4.7.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

Under Alternative 1 expansion of Bridger Bowl into the Slushman and South Fork Brackett drainages would not occur. The Bridger Inventoried Roadless Area (IRA) would not be impacted by the development of a lift, ski trails, or roads. This area would retain its availability for future wilderness consideration and opportunities for semi-primitive recreation would continue from Bridger Canyon. Access to these NFS lands cannot be obtained via Brackett or Middle Cottonwood creeks.

Skiers and snowboarders would continue entering the Slushman drainage that is within the Bridger IRA either by skiing out of bounds or hiking up the mountain through private land from Bridger Canyon. It is also possible to obtain access through NFS lands; the most common areas are Brackett and Middle Cottonwood drainages.

### **4.7.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

The proposed ski area expansion to the south of the existing Study Area would directly affect the Bridger IRA. The proposed new Study Area boundary would encompass about 101 acres of the IRA in the Slushman Drainage. A portion of the S-1 chairlift and portions of ski trails 1S, 2S, and 3S would be within the IRA, resulting in approximately 1.4 acres of vegetation removal and 0.7 acres of grading. Since the trails would be located on open meadows and rock outcroppings, no significant amount of tree cover would be removed to develop this area.

The following provides a discussion of impacts to the six wilderness attributes of the undeveloped IRA lands adjacent to the Bridger Bowl SUP:

#### **Natural Appearance and Natural Integrity (direct and indirect effects)**

Construction of the chairlift and ski trails in the Slushman drainage area would affect both the apparent naturalness and natural integrity, as these activities represent human manipulation of the environment. Some trees would need to be removed for the Slushman lift (S-1). The new chairlift would be apparent to all visitors. The lift corridor and ski trails would be kept clear of trees for the life of the Special Use Permit, so recovery of vegetation within the lift alignment and ski trails would be limited to grasses and low shrubs. This level of vegetation clearing does not appear to be natural and would detract from the natural integrity of the area.

#### *Remoteness and Solitude (direct and indirect effects)*

Tree cutting and lift construction would decrease opportunities for solitude and remoteness in the cutting area, as the sights and sounds of human activity would be readily apparent during clearing and construction. These effects would be short in duration. The use of the lift and the trails within the roadless area would have an impact on wintertime feelings of remoteness and solitude for the life of the SUP.

#### *Special Features and Boundary Management (direct and indirect effects)*

There are no known risks that the current use of the ridge or the planned expansion of the ski area would have any effect on the raptor fall migration route. See Section 4.5 - Wildlife for more details on potential effects to the raptor fall migration route. There are no other known special features within the proposed expansion area.

The boundary of the roadless area would be modified with implementation of Alternative 2. The roadless boundary within the proposed project area to the south follows Slushman Creek. Currently, skiers and snowboarders do not generally ski south beyond Slushman Creek. It is not anticipated that implementation of the action alternatives would encourage skiing beyond Slushman Creek. There would be no impacts to the Bradley Meadows area.

#### 4.7.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

Under Alternative 3 expansion of Bridger Bowl into the Slushman and South Fork Brackett drainages would not occur. The Bridger IRA would not be impacted by the development of a lift, ski trails, or roads. This area would retain its availability for future wilderness consideration and opportunities for semi-primitive recreation would continue.

Skiers and snowboarders would continue entering the Slushman drainage that is within the Bridger IRA either by skiing out of bounds or hiking up the mountain through private land from Bridger Canyon. It is also possible to obtain access through NFS lands; the most common areas are Brackett and Middle Cottonwood drainages.

#### 4.7.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

In Alternative 4, the proposed ski area expansion to the south of the existing SUP would directly affect the Bridger IRA just like Alternative 2. The proposed new SUP boundary would encompass about 101 acres of the IRA in the Slushman Drainage. A portion of the S-1 chairlift plus portions of ski trails 1S, 2S, and 3S would be within the IRA, resulting in vegetation removal of approximately 1.4 acres and grading of 0.7 acres. Since the trails would be located on open meadows and rock outcroppings, no significant amount of tree cover would be removed to develop this area.

A discussion of impacts to the six wilderness attributes of the undeveloped IRA lands adjacent to the Bridger Bowl SUP is given in Alternative 2.

#### 4.7.5 FOREST PLAN CONSISTENCY

Construction of ski area facilities such as lifts and ski trails are consistent with MA 2 direction. The Bridger IRA within and adjacent to the proposed project area was assigned MA 2. The Forest Plan provides no general direction for roadless areas; the direction comes from the management areas within which these lands are allocated (Forest Plan Annual Monitoring Report, 1992. Item 14, p. 56). MA 2 consists of those portions of Bridger Bowl under Special Use Permit, as well as National Forest System lands north and south of the existing permitted area. The MA includes existing ski trails, lift facilities, and lodges, as well as areas that have potential for development or expansion of facilities to meet increasing demand for downhill skiing.

## **4.8 AIR QUALITY**

### **4.8.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

Chapter 3 indicates that although no specific air quality information exists for Bridger Bowl, the air quality conditions in the vicinity of Bridger Bowl are good with low ambient concentrations of pollutants due to limited development and excellent wind dispersion. Pollutant levels are well below state and federal air quality standards. Under Alternative 1, no significant change in the existing air quality would be expected to occur.

Under Alternative 1, skier use at Bridger Bowl could increase slightly. As a result, vehicular traffic to and from Bridger Bowl may also increase. In addition, ongoing residential development, associated wood burning, and vehicle traffic would increase emission levels around the Bridger Bowl base area. However, these impacts would be negligible, and therefore no significant impacts to air quality at Bridger Bowl are anticipated with selection of Alternative 1.

### **4.8.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

With selection and implementation of Alternative 2, pollutants are expected to remain well below Montana and NAAQS. No individual sources of emissions requiring an air quality permit from the MDEQ (ARM 16.8.1102) are proposed. The MDEQ advises that the minor source baseline data for Bridger Bowl has not been triggered; hence an increment consumption or PSD analysis is not required for the relatively minor Bridger Bowl emission sources.

Short-term air quality effects from the expansion construction activities include increased vehicle and equipment emissions, and increased suspended particulates from construction equipment and other site preparation activities. The clearing of ski trails, road construction, and base area facility building would have minimum impact on air quality—primarily dust and equipment emissions. The burning of slash piles would pose the greatest short-term air quality impact. Most of the pile burning would take place during early to late fall and would be in compliance with the Montana Smoke Management Memorandum of Agreement (Montana DSL, 1988). The SIS smoke impact spreadsheet (Air Sciences, 2003) was used to estimate PM<sub>2.5</sub> emissions from the 51.4 acres of ski runs in the SF Brackett Creek which would be cleared without grading. For this procedure, the whole tree would be yarded to landings near the Limestone Chalet area, where the limbs would be removed, the boles hauled away, and the slash burned.

The SIS model for slash burning estimated that about an acre of slash material would be burned total, and the slash pile would average 15' in depth in moderate wind dispersion conditions. The model outputs included about 369 tons of mass consumed, and 2.49 tons of PM<sub>2.5</sub> emissions (using the CONSUME pile burn part of the SIS model). The modeled PM<sub>2.5</sub> concentrations (using the CALPUFF part of the SIS model) were estimated at 57.9 ug/m<sup>3</sup> of PM<sub>2.5</sub> at 0.1 miles from the piles decreasing to 1.9 ug/m<sup>3</sup> of PM<sub>2.5</sub> at the Bridger Bowl base area about 1.3 miles from the Limestone Chalet. The PM<sub>2.5</sub> concentrations would

comply with the NAAQS PM<sub>2.5</sub> 24 hour standard (65 ug/m<sup>3</sup>) at the ambient point of concern (Bridger Bowl base area). The coarse particulates would increase during these short-term burning events, but would rapidly decrease as fuels are consumed. Slash piles tend to ignite rapidly and burn quickly so the smoke emissions dissipate quickly. Because most of the vegetation that is cleared during project implementation would be sold as merchantable timber or be lopped and scattered, it is expected that there would be relatively small amounts of slash burned for Alternative 2. Therefore, any slash burned would not cause any long-term air quality impacts.

Increased vehicle traffic would occur at Bridger Bowl with associated increases in tailpipe emissions, primarily hydrocarbon and nitrogen oxides. Increased vehicle emission impacts would occur from Bozeman to Bridger Bowl, primarily within an hour of lift opening and closing. With the exception of pre-season and post-season maintenance operations and relatively light summer use, traffic would be over snow covered or wet road surfaces that would limit or eliminate road source particulates. However, during summer months, road use at the base area and Deer Park Chalet would generate some dust and suspended particulates.

Peak weekend 1-hour vehicle emissions in the Bridger Bowl base area for Alternative 2 were estimated using AP-42 (EPA, 1998) emission factors for light duty gasoline powered vehicles (autos, pickups, and vans). As shown in Table 4.8-1, the Alternative 1 peak weekend hour would increase to an estimated 1277 vehicles/ hour in Alternative 2. Hydrocarbon emissions during the 2010 peak weekend hour would increase from an estimated 345 grams/hr in Alternative 1 to 804 grams/hr in Alternative 2. Carbon monoxide would increase from an estimated 5,080 grams/hr in Alternative 1 to 11,900 grams/hr in Alternative 2. Nitrogen oxides would increase from an estimated 476 grams/hr in Alternative 1 to 1117 grams/hr in Alternative 2.

**Table 4.8-1  
Peak Weekend Hour Vehicle Emissions**

Parameter	Alt. 1	Alt. 2
Vehicles per hour	545	1,277
Hydrocarbons (g/hr)	345	804
Carbon Monoxide (g/hr)	5,080	11,900
Nitrogen Dioxide (g/hr)	476	1,117

Emissions were slightly overestimated by assuming weekend peak hour emissions would occur for an 8 hour day during a 120 day ski season, therefore total emissions would be 0.85 tons of hydrocarbons, 12.6 tons of carbon monoxide, and 5.4 tons of nitrous oxides which if combined into a stationary source of 18.9 tons/year would be too low to require an air quality permit from the Montana DEQ (ARM 16.8.1102). Since these numbers meet the MAAQS and NAAQS, no significant impacts to air quality would be expected from current or potential vehicular traffic due the effects of drainage winds on the local airflow.



Some increase in the use of wood stoves and fireplaces would occur as Bridger Bowl base area development expands (Bridger Pines). Increased residential wood burning from houses and rental units would increase particulate matter, and to a lesser degree carbon monoxide, nitrogen oxides, and organic compound emissions. New fireplaces and wood stoves must comply with the 40 CFR 60.352 standards for particulate matter. Only certified stoves, furnaces, or catalytic converters that comply with the standards would be installed.

Wood burning particulate emissions in the Bridger Bowl base area were estimated with data from the State of Montana (1991) using emission rates of 3.26 grams/hr for wood burning stoves and 7.37 grams/hr for fireplaces. Alternative emissions were estimated assuming 153 wood burning stoves and 5 fireplaces. Assuming all stoves and fireplaces operated for 24 hour/day for a 120 day season total particulate emissions would be 1.70 tons for Alternative 2, a 22 percent increase. These emissions would be spread over a 120 day period and would be expected to be well below MAAQS and NAAQS standards.

#### 4.8.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

Air quality effects of Alternative 3 would be slightly less than Alternative 2 in that the proposed development in Slushman Creek drainage would not occur. Under Alternative 2, no exceedances of the MAAQS or NAAQS were identified, therefore, Alternative 3 would also result in no exceedances of the MAAQS or NAAQS.

#### 4.8.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

Air quality effects of Alternative 4 would be slightly less than Alternative 2 because the proposed development in the South Fork Brackett Creek drainage (Bradley Meadow area) would not occur. Under Alternative 2, no exceedances of the MAAQS or NAAQS were identified; therefore, Alternative 4 would also result in no exceedances of the MAAQS or NAAQS.

#### 4.8.5 FOREST PLAN CONSISTENCY

The Forest would comply with the Montana Department of Environmental Quality in the SIP. The requirements of the SIP and Montana Smoke Management Memorandum of Agreement would be met (Forest Plan II-23).

## **4.9 CULTURAL RESOURCES**

### **4.9.1 DIRECT AND INDIRECT EFFECTS**

As there are no recorded cultural sites within the project area, there would be no direct, indirect or cumulative effects to cultural resources under any of the alternatives.

In their 1999 comment letter, the Confederated Salish and Kootenai Tribes of the Flathead Nation indicated that the project would have no impact on their cultural resources:

“As requested we have conducted a review of our cultural resource records for the [Bridger Bowl Master Development Plan] project location. Currently, we have no information which suggests that this action would impact significant cultural, historical or spiritual-use sites.” (White, 1999)

All alternatives are consistent with Forest Plan standards for cultural resources (p. II-17). In accordance with Federal Laws and Regulations, the FS has fulfilled its obligation relating to the Historic Preservation Act of 1966 (as amended) and the Archaeological Resource Protection Act of 1979.

### **4.9.2 FOREST PLAN CONSISTENCY**

As directed by the Forest Plan, a cultural resource inventory was conducted for the Study Area. Because no cultural resources were identified within this area, there would be no effects as a result of implementation of this proposal. The project would be consistent with the Forest Plan standards for cultural resources.

## **4.10 RECREATION**

The primary focus of this proposal is to improve the overall recreation experience at Bridger Bowl for current users and to maintain high quality conditions for anticipated future users. Each of the action alternatives would provide additional developed winter recreation opportunities within and adjacent to the SUP area, with increased access to the ridge and expansion to the north and/or south. They also propose additional lift and trail construction within the expansion areas. Completion of the new day lodge and construction of the Limestone Chalet, while not included in this proposal, would also increase guest service space and help improve the quality of the experience as well.

### **4.10.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

#### **Alpine Skiing**

Alternative 1 would represent no change in ski area operations at Bridger Bowl. With selection of Alternative 1, there would be no expansion of the SUP boundary to the north or the south of the existing ski area and no change in the Management Area prescriptions for lands in the vicinity of Bridger Bowl. With selection of Alternative 1, there would be no new lift construction or trail development. Existing conditions would persist, including circulation and distribution problems relative to the Alpine and Bridger lifts, multiple ability levels skiing together on novice trails, and perceived crowding on mid-mountain trails (especially on days with delayed opening of the ridge). Bridger Bowl skiers would also continue to experience long lift lines on weekends and holidays. With selection and implementation of Alternative 1, Bridger Bowl would be unable to meet the expectations and demands of today's skier market with no technological upgrades and no expansion of terrain.

Skier visitation at Bridger Bowl would continue to be directly related to population growth in the local area; however, it would also be inhibited by lack of capital improvements. As a result, the anticipated increase in annual skier visitation to Bridger Bowl would be modest and is not anticipated to accommodate regional population growth of 1.5 percent per year. Without facility upgrades or terrain expansions, Bridger Bowl would have a difficult time competing in the marketplace. Alternative 1 would indirectly result in increased visitation at other ski areas in the state, as limited capacity at the Bridger Bowl would cause both local and regional skiers to seek alternative locations.

The economic viability of a ski area is directly related to the quality of the skiing experience. The quality of the experience is relative to the level of crowding on the slopes, the extent of lift lines, and the price of various skier services. As the population growth continues in and around Gallatin County, the ski area would experience a reduction in the quality of the experience as well as a decrease in its economic viability. As a result, more skiers would travel to other resorts in the area, which would further reduce the viability of the resort as a result of declining skier visitation.

## Other Recreation

Under Alternative 1, unauthorized access to NFS lands through the permit area and adjacent private lands would continue, as would concerns regarding avalanche hazards and accessibility for search and rescue teams the Slushman drainage and Bradley Meadows. Alternative 1 would represent no change to other existing recreation opportunities in the area, such as the Bohart Ranch Nordic skiing operation, dispersed backcountry skiing, snowmobiling, and various summer activities.

### 4.10.2 DIRECT AND INDIRECT EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Under all action alternatives, Bridger Bowl proposes to remove the existing Alpine Lift and construct two new lifts (A-1 and A-2) in alternate alignments to replace it. The A-1 Lift would be constructed from 6,520 feet to 7,380 feet in elevation and have a length of approx 3,700 feet, with a design hourly capacity of 1,800 skiers. This lift would service the existing intermediate and advanced terrain from Limestone Flats to the North Bowl.

The A-2 Lift would be constructed from 6,550 to 7,380 feet in elevation and have a length of approximately 3,800 feet, with a design hourly capacity of 1,800 skiers. This lift would improve service to the existing terrain on the north side of the existing Alpine Lift. The two new lifts would improve the separation of ability levels and increase the number of repeat skiers in the Alpine terrain area, while helping to maintain low skier densities.

Bridger Bowl proposes to upgrade the Bridger Lift in its existing alignment to a fixed grip triple that has a design capacity of 1,800 skiers. Once the Bridger Lift is modified as proposed, the Deer Park Lift would experience crowding in the unload area at the top terminal. As a result, Bridger Bowl proposes to shorten the top terminal of this lift down to 7,380 feet in elevation. They would also replace the bottom terminal with a more modern, more compact hydraulic system, thereby improving skier distribution in this area, make the lift better suited for early season operations, improve access from terrain in the Pierre's Knob pod to the Deer Park Chalet, better accommodate race training, and improve access to groomed trails for more guests.

#### *Connected Actions*

Modifications to the existing Virginia City Lift and the proposed Limestone Chalet are projects that would occur on adjacent private lands and are therefore not governed by the Forest Service. As connected actions, however, the effects of these project elements must be disclosed in this proposal. These two project elements are common to all action alternatives.

Bridger Bowl proposes to relocate the bottom tension terminal of the Virginia City Lift uphill about 200 feet to alleviate congestion on the south side of the day lodge. Additionally, the Limestone Chalet would be constructed on private lands slightly uphill and to the south of the bottom terminal of the proposed N-1 Lift. The addition of this facility would provide additional on-mountain skier services and help reduce some of the

congestion in the base area. The Limestone Chalet would offer food service, restrooms, a place to warm up, and incidental retail. All proposed facilities would meet ADA<sup>1</sup> requirements under each of the action alternatives. Accordingly, Alternative 2 would represent improved access for physically challenged visitors.

#### 4.10.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2

##### **Alpine Skiing**

Alternative 2 would provide additional terrain primarily for intermediate and advanced level skiers. With selection of Alternative 2, the Bridger Bowl SUP boundary would be expanded by approximately 337 acres to the south into the Slushman Drainage and approximately 274 acres to the north into the Bradley Meadows area.

The expansion of the SUP boundary north into Bradley Meadows would include construction of the N-1 Lift from 6,800 feet to 7,880 feet in elevation with an approximate length of 5,082 and a design hourly capacity of 1,800 skiers. This lift would provide access to the eight proposed trails within the N-1 pod and to the proposed P-3 pod. The P-3 Lift would be constructed from 7,860 feet to 8,530 feet in elevation with a length of 1,470 and a design hourly capacity of 300 skiers. It would offer lift access to the north end of the ridge. One new trail associated with the P-3 Lift is proposed for construction under Alternative 2.

The expansion of the SUP boundary to the south into the Slushman Drainage would include construction of the S-1 Lift on the south side of the ridge in the Slushman Drainage from 7,000 feet to 7,900 feet in elevation with a length of 2,330 and an hourly design capacity of 1,800 skiers. This lift would be specifically sited to avoid historic avalanche activity. This lift would provide access to the five proposed trails within the S-1 pod and to the proposed P-2 Lift, most of which would be advanced and expert terrain. Trail S-5 would allow skiers in the S-1 pod to return to the main mountain. The P-2 Lift would offer lift access to the south end of the ridge. Two additional trails would be constructed in conjunction with the P-2 Lift.

Expansion into both the Slushman and Bradley Meadow areas would provide new and varied terrain for existing skiers and allow for expansion to accommodate expected growth. The combination of these two new expansion areas would also provide some unique and distinctive skiing opportunities for intermediate to expert skiers. Consequently, Alternative 2 would likely generate greater visitation and increased economic viability over the long term.

The development of surface lift P-2 would enhance the ability of the ski patrol to control avalanche hazard within the Slushman drainage (i.e., the South ski pod), thereby providing a safer environment for skiers in that area. The incidence of unauthorized backcountry skiing use of the Slushman area would be largely eliminated. Access to the

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<sup>1</sup> Americans with Disabilities Act of 1990 (ADA). A copy of the April 18, 1994 draft of the *Snow Facilities Accessibility Recommendations to the U.S. Transportation and Architectural Barriers Compliance Board* is on file at the Ranger District office.



Slushman drainage would be authorized via the ski area under Alternative 2, and Bridger Bowl would be authorized to conduct avalanche hazard reduction missions, thereby reducing the potential threat to public safety caused by unauthorized use of the area. On any given day, lifts P-2 and S-1 and associated trails would be closed to the public until necessary avalanche hazard reduction work has been completed.

Under Alternative 2, growth in skier visitation would correlate more closely with improvements and expansion to the ski area and its facilities. It may also be affected by the development of overnight accommodations on adjacent private land. Bridger Bowl would accomplish the projects identified in this alternative over a period of time based on anticipated skier demand, project cost and the effects on lift ticket prices, and the competitive effects of other ski areas. At full implementation of Alternative 2, the lifts and terrain of the ski area would have a CCC of 6,100. As the SAOT increases under Alternative 2, skier visitation would be expected to increase at a level commensurate with current utilization rates for ski areas of similar size and market orientation. An increase in lift capacity would increase skier density; however, this is balanced by the increase in skiable terrain. As a result, skier densities would be very similar to those described under existing conditions.

### **Other Recreation**

Revisions to the travel management plan proposed as wildlife mitigation for this proposal would prohibit snowmobile use in SF Brackett Creek. No other direct impacts to snowmobiling use would be expected under Alternative 2. With increased alpine and Nordic skiing visitation, the demand for lodging and other winter recreation activities, such as dining and shopping, would also increase on private land in the vicinity of Bridger Bowl and in the community of Bozeman.

#### *Summer Recreation*

Summer construction of lifts A-1, A-2, and N-1 and associated alpine trails, could temporarily disturb recreation use of the hiking trail that traverses Bridger Bowl. For short time periods (i.e., during construction) the experience of some hiking, horseback riding, and mountain biking enthusiasts may be diminished and/or interrupted. Immediately following construction of a particular lift or ski trail, the hiking trail would be restored. No long-term impacts to summer recreation opportunities in the area would be anticipated.

#### **4.10.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3**

### **Alpine Skiing**

Alternative 3 proposes expansion of the SUP boundary only to the north, including Bradley Meadows. As a result, the N-1 Lift, N trails, P-3 Lift, and P-3 trail as described under Alternative 2 would be constructed. The expansion into Bradley Meadows would provide necessary additional terrain for intermediate skiers, and the P-3 Lift would increase accessibility to the ridge.

Under Alternative 3, Bridger Bowl would not expand its SUP boundary to the south into Slushman Drainage. The S-1 and P-2 lifts and S trails would not be constructed. The proposed new lifts and modifications within the existing area and in the proposed Bradley Meadows expansion area would be installed at higher capacities than under Alternative 2, bringing the lifts and terrain CCC to 5,600. As a result of increased capacity lifts and reduced terrain expansion, skier densities in these areas would be higher than under Alternative 2. This would diminish the skiing/boarding experience as compared to Alternative 2, but it would still represent an improvement over existing conditions.

On a peak day, lift line waits would likely double on the Bridger and Deer Park lifts. Additional skiers and density would be located on the trails associated with Deer Park and proposed A Lifts. Alternative 3 would not fully meet the purpose and need for the proposal, which is to decrease skier density across the mountain and provide a better recreation experience at Bridger Bowl.

Alternative 3 would have additional positive effects to recreation as disclosed under project elements common to all action alternatives with the removal of the Alpine Lift, construction of the A-1 and A-2 lifts, and upgrades to the Bridger and Deer Park lifts within the existing ski area. The Virginia City Lift would be modified to reduce congestion in the base area, and the Limestone Chalet would be constructed, providing additional skier services on the mountain and reducing congestion in the base area.

Overall, visitation growth under Alternative 3 would correlate with improvements and expansion to the ski area. Although it would result in an improvement over existing conditions, Alternative 3 would likely drive less visitation than Alternative 2 over the long term.

### **Other Recreation**

Under Alternative 3, the effects to snowmobiling would be the same as those disclosed under Alternative 2, with use prohibited in SF Brackett Creek. Effects to backcountry skiing would be similar to those disclosed under Alternative 1. Unauthorized access to NFS lands through the permit area and adjacent private lands would continue, as would avalanche safety concerns associated with out-of-bounds skiing in the Slushman drainage.

The effects to summer recreation would be the same as those disclosed under Alternative 2, with minor disruptions during lift and trail construction to the hiking trail that traverses the Bridger Bowl SUP area.

With increased alpine and Nordic skiing visitation, the demand for lodging and other winter recreation activities, such as dining and shopping would also increase on private land in the vicinity of Bridger Bowl and in the community of Bozeman.

#### 4.10.5 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

##### **Alpine Skiing**

Alternative 4 proposes expansion of the SUP boundary only to the south, including the Slushman Drainage. As a result, the S-1 Lift, S trails, P-2 Lift, and P-2 trails as described under Alternative 2 would be constructed. The expansion into the Slushman Drainage would provide additional advanced and intermediate terrain, and the P-2 Lift would increase accessibility to the ridge.

Under Alternative 4, Bridger Bowl would not expand its SUP boundary to the north into Bradley Meadows. The N-1 and P-3 lifts and N trails would not be constructed. The proposed new lifts and modifications within the existing area and in the proposed Slushman Drainage expansion area would be installed at higher capacities than disclosed under Alternative 2, bringing the lifts and terrain CCC to 5,100. As a result of increased capacity lifts and reduced terrain expansion, skier densities in these areas would be higher than under Alternative 2. Lift line wait times would also increase by approximately 25 percent on the proposed Alpine lifts over Alternative 3. This would diminish the skiing/boarding experience as compared to Alternative 2, but it would still represent an improvement over existing conditions.

The avalanche safety benefits derived from surface lift P-2 would be the same as disclosed in Alternative 2. Similarly, the incidence of unauthorized backcountry skiing access to the Slushman drainage would largely be eliminated as a result of adding this area to Bridger Bowl's SUP. Project elements common to all action alternatives as well as the connected actions disclosed previously would occur under Alternative 4. These project elements include the removal of the Alpine Lift, construction of the A-1 and A-2 lifts, and upgrades to the Bridger and Deer Park lifts within the existing ski area. The Virginia City Lift would be modified to reduce congestion in the base area, and the Limestone Chalet would be constructed, providing additional skier services on the mountain and reducing congestion in the base area.

Overall, visitation growth under Alternative 4 would correlate with improvements and expansion to the ski area. Alternative 4 would likely generate somewhat less visitation over the long-term, as compared to Alternative 2.

##### **Other Recreation**

Under Alternative 4, the N-1 and P-3 lifts and their associated trails are not proposed for construction. As a result, short-term lift and alpine ski trail construction related impacts to summer hiking, horseback riding and mountain biking enthusiasts would be less than those disclosed under alternatives 2 and 3. No long-term impacts to hiking opportunities in the area would occur.

With increased alpine and Nordic skiing visitation, the demand for lodging and other winter recreation activities, such as dining and shopping would also increase on private land in the vicinity of Bridger Bowl and in the community of Bozeman.

#### 4.10.6 FOREST PLAN CONSISTENCY

Implementation of alternatives 2 and 3 would require an amendment to the Forest Plan. This would entail:

Changing management area designations in the proposed expansion areas to MA 2, which reflects developed recreation areas/winter sports areas.

A portion of the proposed Slushman skiing pod is located within the Bridger Roadless Area #1543; however, the current Forest Plan has allocated this area to Management Area 2. Accordingly, no amendment to the Forest Plan would be required for development within the Slushman drainage.

All of the alternatives would be consistent with the recreation standards as stated in the Forest Plan.

## 4.11 VISUAL RESOURCES

Under all action alternatives, impacts to visual resources may occur as a result of tree clearing and the construction of lifts and mountain access roads. A visual simulation was developed for Alternative 2, as viewed from BCR, to illustrate potential visual impacts associated with proposed project components (see Figure 4-5). This simulation depicts the worst-case scenario with implementation of the Proposed Action. At this scale it is difficult to display the scalloping and feathering techniques that would be utilized during construction to imitate the characteristic vegetative patterns of the area.

Travelers on BCR heading north within two miles of the Bridger Bowl access road would notice a change in the landscape. The proposed surface lifts and the ski terrain served by these lifts would not be readily visible due to the vertically oriented rock areas and vegetation openings above the existing ski area openings and clear-cut areas. This lack of visual change resulting from the construction of the surface lift and use of the ski terrain is comparable to the existing surface lift (P-1) and existing ski terrain on the ridge. The existing ridge terrain is not readily visible from BCR or the selected viewpoint. Ski trail openings would be visible below the Bradley Meadows ridge.

All action alternatives propose openings that would be designed to replicate the existing opening pattern of the ski area and surrounding higher terrain, with scalloping and feathering of the trails and making use of existing openings. The degree of impact would depend on how the openings are designed with respect to their shape, edge treatment, and width variability. Construction of lifts and trails would be monitored by Forest Service personnel to ensure the use of practices outlined in The National Forest Landscape Management Handbook 617 for Ski Areas (Volume 2, Chapter 7) and State of Montana and Forest Service Region One Best Management Practices (FSH 2509.22, *Soil and Water Conservation Practices Handbook*) would be followed and the projects would be subordinate to the characteristic landscape.

Base area facilities, both existing and proposed, are located on private lands, which are not governed by Forest Plan standards and guidelines, nor are they required to meet VQOs. However, none of them currently are or would be visible to observers along BCR.

### 4.11.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1

Under Alternative 1, the proposed project elements discussed for alternatives 2 through 4 would not be constructed. No new ski trails or lifts would be developed or installed. As such, there would be no impacts to or change in the visual quality of the project area under Alternative 1.

### 4.11.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2

Alternative 2 includes the replacement and modification of lifts within the existing SUP area and development of new lifts and associated trails in both the Slushman and Bradley Meadows areas. Project elements in the Bradley Meadows would likely be more visible to observers along BCR than those proposed in the Slushman area. One element of this



proposal is to amend the Bradley Meadows area from MA 12 to MA 2 with the proposed SUP boundary expansion. As a result, the VQOs assigned to Bradley Meadows would change from *Retention* to *Partial Retention*, which is the designated VQO for the existing Bridger Bowl SUP area.

Proposed lift development and trail clearing in the upper and middle elevation zones would be visible as viewed from BCR (middle ground view). Development in the lower elevation zone would be obscured by topography and vegetation and would not be visible to travelers along BCR. All new lifts and facilities would be required to meet Forest Plan standards and guidelines for visual resources. As such, lift infrastructure would be painted with non-reflective paint.

Proposed clearing within the Slushman area (proposed southern SUP expansion area) would be minimal. The Slushman area is comprised primarily of open meadow with widely scattered individual trees. Clearing would occur to create skiable openings through small tree islands. Sharp lines and shapes uncharacteristic of the surrounding environment would be minimized and broken up where possible by existing openings in the vegetation. Clearings would be designed to replicate natural openings/glades and would not be evident to the casual observer.

Vegetative patterns within the Bradley Meadows area includes large meadows surrounded by dense tree cover. As such, proposed clearing within the Bradley Meadows area would be more evident than clearing discussed within the Slushman area. Trail development within meadows would not involve much clearing and would not be evident to viewers along BCR. However, clearing for proposed *Trails N2, N3 and N4* would occur in more dense vegetative cover and has the potential to introduce more sharp lines, shapes, and forms uncharacteristic of surrounding vegetative patterns (see Figure 4-5). Proposed *Trails N2, N3 and N4* would include scalloped and feathered edges, resulting in a softer line between proposed ski trails and existing vegetative cover, in order to reduce the visual dominance of the project elements. Clearing would be visible to observers along BCR; however, it would remain visually subordinate to the surrounding landscape and would be designed to replicate natural openings.

Proposed lift realignment within the existing SUP area would not introduce any new form or lines, as compared to existing conditions. Openings for skiing in the rocky cliff area, upper elevation zone, would be similar to the existing conditions, with very minor tree removal. These openings would be barely visually discernable from BCR.

Overall, implementation of Alternative 2 would meet the prescribed VQO of *Partial Retention*. As stated previously, expanding the SUP boundary to the north (Bradley Meadows) would modify the management area prescription from MA 12 to MA 2. As such, the prescribed VQO for the area would be modified from *Retention* to *Partial Retention*.

#### 4.11.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

Alternative 3 modifies the Proposed Action by not proposing expansion into the Slushman Drainage. It includes the construction of four new lifts – one surface lift (P-3), and three chairlifts (A-1, A-2, and N-1) for a total of 11 lifts. The replacement and/or modification of two existing lifts (Deer Park and Bridger) would be as described under Alternative 2. Alternative 3 also includes the development of nine new trails in the Bradley Meadows area. This would expand the developed trail network by approximately 52 acres for a total of 459 acres. Lastly, Alternative 3 would increase the Bridger Bowl road network by 1.1 mile to 17.1 miles total.

Overall, implementation of Alternative 3 would meet the prescribed VQO of *Partial Retention* (see Figure 4-5). Expanding the SUP boundary into Bradley Meadows would modify the management area prescription from MA 12 to MA 2. As such, the prescribed VQO for this area would be modified from *Retention* to *Partial Retention* and would be consistent with Forest Plan direction for MA 2.

#### 4.11.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

Alternative 4 modifies the Proposed Action by not proposing expansion into the Bradley Meadows area. Four new lifts would be constructed under Alternative 4; one surface lift (P-2), and three chairlifts (A-1, A-2, and S-1). The replacement and/or modification of two existing lifts (Deer Park and Bridger) would be as described under Alternative 2. Seven new trails would be constructed in the Slushman Drainage area, which would expand the developed trail network by approximately 45 acres. Lastly, Alternative 4 would increase its road network by 1.1 miles to 17.1 miles total.

Implementation of Alternative 4 would meet the prescribed VQO of *Partial Retention*. With no proposed project elements in the Bradley Meadows area, which is more visible from BCR than Slushman, the impacts to visual resources as a result of Alternative 4 would be greatly reduced from those disclosed under alternatives 2 and 3.

#### 4.11.5 FOREST PLAN CONSISTENCY

Implementation of alternatives 2 and 3 would require an amendment to the Forest Plan. This would entail:

Changing the VQO currently assigned to the Bradley Meadows area from *Retention* to *Partial Retention*, which is the VQO that applies to MA 2.

As a result, the proposal would be consistent with Forest Plan Direction for visual quality.



Current view of Bridger Bowl from Bohart Ranch, from approximately two miles north of the ski area along Bridger Canyon Road.



View of Bridger Bowl from Bohart Ranch with implementation of Alternative 2, from approximately two miles north of the ski area along Bridger Canyon Road.

## 4.12 SOCIO-ECONOMICS

Direct, indirect, and induced socio-economic impacts to the study area are expected to increase under all alternatives.

Primary (direct) impacts of the action alternatives include direct payments for goods and services (labor) in connection with the project during construction, as well as long-term operations. Indirect impacts would result from expenditures by project suppliers for machinery and materials such as piping, pumps, accounting services, etc. Induced impacts would generally occur in the wholesale and retail trade and personal services sectors of the economy by households affected by the project. The socio-economic impacts from indirect and induced spending are often referred to as “ripple” or “multiplier” effects, as increased employment income is spread through the economy.

Table 4.12-1 represents long-term quantitative differences between the alternatives addressed in this report. Development under alternatives 2, 3 and 4 would occur over the course of three phases and approximately 10-15 years, pending changes to the marketplace and development of private lands around the ski area for residential use. Alternatives 3 and 4 provide for fewer lifts and trails than Alternative 2, to address specific environmental concerns. Expected social and economic impacts by alternative are generally described below.

**Table 4.12-1  
Summary of Estimated Social and Economic Effects**

	Base	Alt. 1 Long-term <sup>a</sup>	Alt. 2 Long-term <sup>b</sup>	Alt. 3 Long-term <sup>b</sup>	Alt. 4 Long-term <sup>b</sup>
Annual skier visits <sup>c</sup>	167,000	183,000	321,000	300,000	297,000
Development costs	\$0	\$0	\$12,000,000	\$11,500,000	\$11,000,000
Gallatin County population <sup>d</sup>	64,831	74,310	74,860	74,820	74,820
Housing - total units <sup>e</sup>	16,283	18,393	18,513	18,503	18,503
<b>Employment FTE jobs</b>					
Construction Direct/indirect <sup>f</sup>	0	0	13	13	12
Ski area ops direct	87	87	152	142	142
Indirect <sup>g</sup>	164	164	286	267	267
<b>Fiscal considerations</b>					
USFS fees	\$30,005	\$30,005	increase	increase	increase
Fed unempl/soc sec	\$134,637	\$134,637	\$180,000	\$168,000	\$168,000
State unemployment	\$42,289	\$42,289	\$44,000	\$41,000	\$41,000
Property taxes	\$64,178	\$64,178	increase	increase	increase

Source: Bridger Bowl; US Census Bureau; Woods and Poole Economics, Inc.; US Department of Commerce, Regional Employment Multipliers - 1989; US Chamber of Commerce; Sno.engineering, Inc.

In the table above, it is important to note that the effects disclosed are the result of no action or implementation of the action alternatives only; they do not reflect changes in social structure or the economy that may result from sources unrelated to Bridger Bowl. Additionally, the long-term effects disclosed for alternatives 2-4 are contingent upon several factors, including changes in the marketplace and development of private lands near the ski area. Effects represent an additional increase in skier capacity of 127 percent over the long term and resulting increases in visitation and unemployment.

## **Environmental Justice**

None of the alternatives are anticipated to have any significant impact on minority or low-income populations. The potential environmental impacts from implementation of the alternatives would not directly affect the low-income populations that were identified in the city of Bozeman. Potential indirect impacts from implementation of the alternatives would not disproportionately impact these populations. No minority populations were identified within the social and economic analysis area. Furthermore, Bridger Bowl does not discriminate in their hiring practices; therefore, low-income and minority populations would have an equal opportunity to obtain new jobs created by implementation of the alternatives.

No impacts to American Indian cultural resources have been identified under any of the alternatives. For a discussion of Cultural Resource issues related to cultural properties of significance to American Indians, refer to Section 4.9 – Cultural Resources.

The closure of Forest Development Road 3200 during Bridger Bowl's operational season is an existing condition under Alternative 1. This closure is unrelated to the Bridger Bowl Master Plan Proposal, and currently restricts access to some forms of dispersed recreation during the winter under all alternatives. For a complete discussion of dispersed recreation impacts, refer to Section 4.10 – Recreation.

### **4.12.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

In the short-term (one to three years), Alternative 1 represents no significant change to the social and economic climate of the Bozeman and Gallatin Valley areas. Over the long-term (five to ten years), the lack of adequate terrain, lifts, base area facilities, and reliable snowmaking capabilities would likely lead to declines in the ski area's market share, the quality of the ski experience relative to other Montana offerings, and the revenues generated by the ski area.

Alternative 1 represents the potential for long-term negative impacts to the socio-economic climate of the Bozeman area, including minor reductions in the average direct and indirect income and seasonal employment, stagnant or reduced Forest Service fees, and reductions in federal, state, and local revenues and fees paid. Stagnation at the ski area would result in a reduction in the recreation experience, which would directly result in the decreasing economic viability of the ski area.

Reductions in the ski area's ability to adequately serve the needs of its growing local customer base may reduce the appeal of the ski area, which is often cited as a major



recreational opportunity contributing to the quality of life in the area. Population increases are projected to continue for the project area, and demand for skier services is expected to grow accordingly, particularly during weekend and holiday periods. Without enhancements to the current facilities, Bridger Bowl would be unable to adequately serve its local customer base during its typical heavy-use periods, and would not be positioned to grow mid-week destination visitor business, as lifts, terrain, and guest services capabilities would lag behind other Montana and western resorts. Inadequate facilities to handle growing demand could lead to erosion of the local season pass. Lost market share from Bridger Bowl would likely be absorbed by other Montana, Wyoming, or Idaho ski resorts. As mentioned in the Recreation Section (Section 4.10), national skier visit totals have increased by approximately 5.5 percent and Montana skier visit totals have increased by approximately ten percent over the past ten years, as the state's promotion division has drawn attention to Montana ski areas for destination visitors, and other state ski areas have invested in improvements.

#### 4.12.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2

The improvements proposed under Alternative 2 would result in positive short-term direct and indirect impacts to employment and income in the project areas, as the result of expenditures by project suppliers and subcontractors.

Long-term employment impacts would generally be gradual in response to the development of new lifts and facilities at Bridger Bowl and increasing visitation. By the year 2013, it is expected that employment at Bridger Bowl would increase by approximately 65 full-time equivalent (FTE) jobs, with proportional increases to employment tax payments and indirect jobs. In the short-term (one to three years), it is expected that most new jobs would be absorbed by the existing labor force. Over the long-term (five to ten years), additional employment generated by the ski area may have a modest impact on population and housing by attracting new employees from outside of the area; however, projected growth rates unrelated to ski area expansion suggest that the majority of new ski area related jobs would most likely be absorbed by the projected local labor force.

Replacing older and less efficient lifts, and adding more terrain for intermediate and advanced skiers would create greater on-hill capacity for the ski area. In the long-term, increased capacity would allow Bridger Bowl to effectively serve its growing local market, as well as make it a more attractive option for Montana's growing destination skier market.

The parking expansion and base area facility improvements would be important complements to increased on-hill capacity and necessary to accommodate the demand already created by the Bozeman area's population growth. Modern amenities and convenience in the base area facilities are also important components for attracting and serving destination skiers. Population growth would be anticipated to continue as projected in Table 3.12-1 regardless of the proposed expansion at Bridger Bowl. Enhancing the overall recreation experience would serve to improve the economic viability of the resort in the long term.

#### 4.12.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

The improvements proposed under Alternative 3 would result in positive short-term direct and indirect impacts to employment and income in the project areas similar to those under Alternative 2, as the result of expenditures by project suppliers and subcontractors. Short-term construction related impacts would be slightly less than in Alternative 2, since the lift and trail network serving the Slushman drainage would not be developed. By the year 2013, it is expected that employment at Bridger Bowl would increase by approximately 55 full-time equivalent (FTE) jobs, with proportional increases in employment tax payments and indirect jobs.

In the long-term, the comparative difference in impacts between alternatives 2 and 3 would be modest. The absence of the Slushman drainage lift and trail network would result in somewhat higher skier densities within the existing ski area and the north skiing pod, and likely would result in a smaller increase in skier visitation. Otherwise, Alternative 3 would produce the same benefits in ski terrain and skier services as Alternative 2. In the long-term, no significant difference in impacts would be expected between alternatives 2 and 3. Alternative 3 would result in creation of fewer acres of intermediate to advanced skiing, which could have a slight negative effect on skier visitation, although it would be an improvement over the existing condition. Alternative 3 would otherwise produce all of the same benefits in ski terrain and skier services as Alternative 2.

#### 4.12.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

The improvements proposed under Alternative 4 would result in positive short-term direct and indirect impacts to employment and income in the project area similar to those described for alternatives 2 and 3, as the result of expenditures by project suppliers and subcontractors. Short-term construction related impacts would be slightly less than in Alternative 2, since the lift and trail network serving the north skiing pod would not be developed. By the year 2010, it is expected that employment at Bridger Bowl would increase by approximately 55 full-time equivalent (FTE) jobs, with proportional increases employment tax payments and indirect jobs.

In the long-term, the comparative difference in impacts between alternatives 2 and 4 would be modest. The absence of the lift and trail network in Bradley Meadow would result in somewhat higher skier densities within the existing ski area and the Slushman skiing pod. This would also likely result in a smaller increase in skier visitation. Otherwise, Alternative 4 would produce the same benefits in ski terrain and skier services as Alternative 2.

#### 4.12.5 FOREST PLAN CONSISTENCY

No Forest Plan standards or guidelines have been determined for social and economic resources, either forest-wide or for MA 2.

## 4.13 TRANSPORTATION

### 4.13.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1

Under Alternative 1, the existing level of skier use is expected to continue to grow with respect to population growth in the area.

#### Growth Rates

Population projections were made for the greater Bozeman area in the *Greater Bozeman Area Transportation Plan - 2001 Update*. A growth rate of 1.6 percent was determined from 1997-2002. Discussions with the Gallatin County Planning Office indicate that growth rates for Bridger Canyon have been significantly less than for the remainder of the county. This is due to the extremely exclusive nature of the zoning restrictions which apply to the Bridger Canyon Zoning District. Based on this information, a growth rate of 1.0 percent per year was estimated for projecting future traffic volumes on the roads in Bridger Canyon.

#### Traffic Volumes on Bridger Canyon Road

The existing daily traffic volumes for 2002 were factored up by 1.0 percent annual growth rate to project future volumes for the year 2010. These future projections correspond to the time frame for at least partial implementation of the action alternatives for Bridger Bowl. This analysis is based on the peak hour traffic volumes resulting from ski area traffic. Projected peak hour traffic volumes were calculated for the year 2010 daily volumes on the roads in the Bridger Canyon area. Projected peak hour traffic volumes for weekends and week days are shown below.

**Table 4.13-1**  
**Alternative 1 Projected Peak Hour Traffic Volumes in 2010 (vehicles/hour)**

Mile Post Along BCR	Total Traffic on Peak Week Day (am/pm)	Total Traffic on Peak Weekend Day (am/pm)
MP-8 <sup>a</sup>	489	708
MP-15	370	607
MP-17	64	66

<sup>a</sup> The 2002 data utilizes MP -8, 15, and 17. The 1999 EIS used road segment names. A determination was made to use mile markers to provide the best comparison of data.

#### Future Level of Service

A future LOS analysis was performed on BCR segments and on the intersections in the area to determine the impacts of the No Action Alternative for Bridger Bowl. The LOS analysis was performed in accordance with the methods outlined in the Transportation Research Board's *Highway Capacity Manual, Special Report 209*.

The LOS analysis for Alternative 1 was performed using the projected year 2010 morning and evening peak hour traffic volumes. The analysis was performed for peak hours based on both weekend and week day traffic conditions. These volumes for Alternative 1 represent future traffic conditions, with no change to the current operations at Bridger Bowl. The LOS analysis for this alternative does not include any additional development on adjacent private lands. The peak hours used in the analysis correlate to the peak hours of traffic generation at the ski area. The results of the LOS analysis for the road segments and the intersection LOS analyses for Alternative 1 are shown in the following tables.

**Table 4.13-2**  
**Alternative 1 Future Road Segment Level of Service Analysis**

Segment of BCR	Year 2010 Level of Service	
	Week Day (a.m./p.m.)	Weekend Day (a.m./p.m.)
Kelly Canyon Rd. to Jackson Creek Rd.	B/C	C/C
Jackson Creek Rd. to Bridger Bowl Access Rd.	B/C	C/C

Source: Robert Peccia and Associates, Inc.

The results of the road segment Level of Service analysis indicate that the BCR functions at an acceptable LOS B or C on week days under the No Action Alternative for Bridger Bowl. On weekend days this road operates at an acceptable LOS C, with the exception of Segment 1, which degrades to a LOS D during the evening peak hour.

**Table 4.13-3**  
**Alternative 1 Future Intersection Level of Service Analysis**

Intersection	Year 2010 Level of Service	
	Week Day (a.m./p.m.)	Weekend Day (a.m./p.m.)
BCR & Kelly Canyon Rd.	A/A	A/A
BCR & Bridger Bowl Access Rd.	A/A	A/A
BCR & Jackson Creek Rd.	A/A	A/A

Source: Robert Peccia and Associates, Inc.

The intersection analysis reveals that under the Alternative 1, the four main intersections along BCR are expected to function at an acceptable LOS A. On weekend days when Bridger Bowl is experiencing design skier activity levels, a LOS D results for eastbound left-turning movements at the intersection of BCR with Griffin Drive and North Rouse Avenue during the evening peak hour in the year 2010. The intersection of Griffin Drive with North Seventh Avenue is projected to function at an acceptable LOS A or B under Alternative 1. The conclusion is that BCR would be able to accommodate, with a desirable level of service, background and ski area traffic under Alternative 1.

#### 4.13.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVES 2, 3, AND 4

Implementation of alternatives 2-4 is projected to result in a guest services CCC of 5,400 at Bridger Bowl, as limited by base area facilities and infrastructure.

##### **Background Traffic Volumes**

The annual growth rates and future projections of traffic volume background levels for alternatives 2-4 in the year 2010 are the same as those estimated for Alternative 1. Future peak hour traffic volumes generated by Bridger Bowl under alternatives 2-4 for the year 2010 were calculated based on the ratio of expected design day skier visits compared to Alternative 1. These future projections correspond to full implementation of proposed project elements under alternatives 2 through 4.

Future ski area traffic volumes were also estimated with the addition of development on adjacent private lands for residences and lodging, as required by the Bridger Canyon Zoning Regulations. It is assumed that a number of the skier visitors would come from guests staying at the adjacent private development; this development would further reduce traffic flows along BCR, as those skiers would reside near the mountain and not commute from Bozeman during peak hours.

**Table 4.13-4**  
**Projected Peak Hour Traffic Volumes in 2010**  
**under the Action Alternatives (vph)**

<b>Mile Post Along BCR</b>	<b>Total Traffic on Peak Week Day</b>	<b>Total Traffic on Peak Weekend Day</b>
<b>MP-8</b>	864	1,390
<b>MP-15</b>	764	1,325
<b>MP-17</b>	72	81

##### **Future Level of Service**

A future LOS analysis was performed on two segments of BCR and three intersections in the area to determine the impacts of the proposed expansion of Bridger Bowl under alternatives 2-4. This analysis includes increased ski area traffic levels as a result of the proposed ski area expansion. The LOS analysis was performed using the projected year 2010 morning and evening peak hour traffic volumes for alternatives 2-4, including both background and ski area traffic.

The peak hours used in the analysis correlate to the peak hours of traffic generation at the ski area. The results of the LOS analysis for the road segments and the intersection analyses for alternatives 2-4 are shown in the tables below.



**Table 4.13-5  
Alternatives 2, 3, and 4 Future Road Segment LOS Analysis**

Segment of BCR	Year 2010 Level of Service	
	Week Day (a.m./p.m.)	Weekend Day (a.m./p.m.)
Kelly Canyon Rd. to Jackson Creek Rd.	D/D	E/E
Jackson Creek Rd. to Bridger Bowl Access Rd.	C/D	E/E

The road segment Level of Service analysis indicates that under proposed expansion alternatives 2-4, the additional traffic generated by the ski area results in increased traffic volumes on BCR. Service levels on BCR for the year 2010 are at LOS C and D for week day peak hours, degrading to LOS D and E during peak hours on the weekend.

**Table 4.13-6  
Alternatives 2, 3, and 4 Future Intersection LOS Analysis**

Intersection	Year 2010 Level of Service (AM/PM Peak Hour)	
	Week Day	Weekend Day
BCR & Bridger Bowl Access Rd.	A/A	A/A
BCR & Jackson Creek Rd.	A/A	A/A1
BCR & Kelly Canyon Rd.	A/A	A/A2

The intersection analysis reveals that under alternatives 2-4, the four main intersections along BCR would be expected to function at an acceptable LOS A or B during week day peak hours; although on the Griffin Drive approaches, eastbound left-turns and westbound turns would experience LOS D and E conditions during week day evening peak hours. Three of the four intersections would continue to operate at LOS A on weekend days although the Jackson Creek and Kelly Canyon Road approaches would experience LOS D or E during weekend evening peak hours in the year 2010.

### **Traffic Safety**

The LOS analysis presented in Chapter 3 shows that the road segments analyzed along BCR currently have LOS grades of A to C, indicating that they are capable of operating with little traffic congestion and vehicle delay. The implementation of alternatives 2-4 would result in increased traffic volumes on BCR, and the LOS grades along BCR would be reduced to C for week day morning peak hours, demonstrating that the road systems are adequate for handling the proposed amount of traffic volume. However, the grades are reduced to D and E for week day evening peak hours and weekend peak hours, indicating that the road system is considered borderline or inadequate in handling the amount of proposed traffic volume.

It is anticipated that the selection of alternatives 2-4 would produce peak hour traffic volumes along BCR that the road system may be unable to adequately support. From 8:30-9:30 am and 4:00-5:00 pm, the road would potentially have an unacceptable level of traffic. However, throughout the remainder of the day, BCR could accommodate projected traffic as a result of the implementation of one of the action alternatives. The increased traffic volume would strain the ability of Gallatin County to adequately maintain the road at acceptable conditions. As a result, vehicle accidents would be expected to increase proportionally to the growth in traffic volume.

## **Parking**

Although parking would be constructed on adjacent private lands, alternatives 2-4 account for expansion of the parking facilities to meet the design capacity as stipulated by the Bridger Canyon Zoning Ordinance for parking on private lands adjacent to the existing parking area.

The existing transit systems in place are currently underutilized. With greater incentive for people to ride the shuttle buses provided by the resort (for locals in town and guests staying at nearby hotels), the demand for parking will not be increase in order to provide skiing for those visitors choosing the shuttle service. With increasing demand for the local bus service, Bridger Bowl would likely increase the transit supply.

### **4.13.3 FORESTPLAN CONSISTENCY**

No Forest Plan standards or guidelines have been outlined for traffic, transportation, and parking either forest-wide or for MA 2. However, under direction for facilities on NFS lands, certain standards apply to transportation on roads and trails on NFS lands. The proposal is consistent with this direction.

#### **4.14 INFRASTRUCTURE AND UTILITIES**

Effects to infrastructure and utilities are primarily related to public safety, demand/consumption, efficiency, and reliability. Domestic water effects include availability and quality of potable water for consumption at day lodges and chalets. Potential effects to electrical distribution are primarily related to availability, reliability, and auxiliary power. Fuel storage is typically measured by safety and efficiency. Mountain access network effects are primarily associated with lift construction and maintenance access. In this analysis, the action alternatives would increase the guest services CCC to approximately 6,200 skiers with construction of the Limestone Chalet.

##### **4.14.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

#### **Domestic Water**

Selection of Alternative 1 would result in no change to the existing conditions at the resort. No change would be anticipated in the amount of domestic water utilized by Bridger Bowl. No changes would be made to the existing wells, pumps, or storage basins.

#### **Wastewater**

As stated previously, Alternative 1 would result in no change to the existing conditions of the resort. Operations and maintenance would continue as they do currently. The recently upgraded wastewater treatment system is capable of accommodating 5,400 skiers per day and would serve the Jim Bridger Lodge, the Ski Patrol building, the Deer Park Chalet, and the new day lodge upon its completion.

#### **Power**

Selection of Alternative 1 would equate to no changes in the existing operations of the resort. There would be no increase in demand for electricity, as no new lifts or facilities would be constructed. Electric power utilization rates at Bridger Bowl would be anticipated to remain fairly constant as a function of number of operating days per season.

#### **Fuel Storage**

Bridger Bowl has adequate fuel supply and storage to accommodate its needs under the existing conditions. Selection of Alternative 1 would maintain ski area operations as they currently are; therefore, there would be no change anticipated with respect to fuel supply or storage at Bridger Bowl.

#### **Mountain Access Roads**

The existing mountain access road system provides access to the tops of the Alpine, Bridger, and Pierre's Knob lifts. Selection of Alternative 1 would maintain existing

conditions, and no new lifts or trails would be constructed. As a result, the existing roads would remain adequate to accommodate summer lift maintenance needs.

#### 4.14.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2

##### **Domestic Water**

Selection of Alternative 2 would result in an increase in the resort's guest services CCC to 6,200 guests. Construction of the Limestone Chalet would require obtaining a permit from the MDEQ for digging a new well adjacent to the facility to serve its domestic water needs. The existing wells would be able to accommodate an increase in demand at their respective facilities, as currently there is enough water (22,400 gpd) to serve this increase in demand.

##### **Wastewater**

Construction of the Limestone Chalet would also require a permit from MDEQ and would entail the construction of a small, on-site wastewater treatment system. The chalet is anticipated to accommodate approximately 800 people per day. On peak days, it could accommodate as many as 960 people. As a result, the discharge to groundwater system would have the capacity of approximately 3,000 gpd, to accommodate the current rate of three gallons per person per day.

##### **Power**

With selection and implementation of Alternative 2, Bridger Bowl would remove one lift (Alpine), install four new chairlifts (A-1, A-2, N-1, and S-1) and two surface lifts (P-2 and P-3), and upgrade the Bridger Lift. Alternative 2 would also entail construction of the Limestone Chalet, which would utilize electricity for lights, heating, and cooking. Northwestern Energy has indicated that the existing power infrastructure is adequate to accommodate up to a 50 percent increase in demand over existing conditions (Cole, 2003).

Several short spurs from the existing lines would be required to reach the proposed lifts and the Limestone Chalet. To provide power to the bottom and lower terminals of proposed lift S-1 and the lower terminal of proposed surface lift P-2, a buried power line would tie in to the existing power line that ends at the bottom of the Pierre's Knob Lift. This proposed power line would follow a mountain access road (portions of which are existing and proposed) to reach the lower terminal of the proposed S-1 Lift (approximately 7,394 feet in length). This line would then continue up the lift corridor to provide power to the top terminal of the S-1 Lift (approximately 1,865 feet in length). A third spur would then run from the upper terminal of S-1 to power the lower terminal of the proposed P-2 surface lift (approximately 76 feet in length).

To provide power to the relocated top terminal of the Deer Park lift, a spur would be trenched into an existing mountain access road; this would tie into the existing buried power line within the Bridger Lift corridor (approximately 484 feet in length). Power to

the A-1 lift would be delivered via the existing overhead power line to Alpine Lift. The line would also be extended to the top of the A-2 Lift.

Power to the lower terminal of the N-1 Lift and Limestone Chalet would be delivered from the lower terminal of the A-2 lift. Power to the upper terminal of N-1 and lower terminal of P-3 would be delivered from the top terminal of A-2 Lift. For example, power to the N-1 lift would be constructed when the N-1 lift is constructed, even if the A-1 A-2 lifts had not yet been installed.

### **Fuel Storage**

There is adequate fuel storage at the maintenance shop and in the base area to accommodate the proposed improvements to the resort. Additional lift infrastructure, each with its own APU, would create a minor increase in demand for additional diesel fuel; the storage tank at the maintenance shop would be refilled more frequently as necessary. Because the Limestone Chalet and the lift shacks associated with the proposed lifts would be heated via electricity, there would be no increase in demand for propane at these facilities.

### **Mountain Access Roads**

Selection and implementation of Alternative 2 would result in the construction of seven new road segments for lift construction and maintenance access. These roads would be short spurs off of the existing mountain road network. One spur would be constructed from the end of the existing road in Trail 14 and continue to the bottom terminal of the proposed S-1 Lift (approximately 3,273 feet in length). To access the Limestone Chalet, a spur would be constructed from the existing road in Trail 54 (approximately 789 feet in length). A third spur would be constructed from the existing road accessing the top terminal of the Alpine lift to the top terminal of the A-2 lift (approximately 1,181 feet in length). A fourth spur would be constructed from the top terminal of the existing Alpine Lift to the top terminal of the proposed N-1 Lift (approximately 2,300 feet in length). The fifth spur would run from the top terminal of N-1 to the bottom terminal of the proposed P-3 surface lift (approximately 243 feet in length). The total length of proposed road segments would be approximately 1.8 miles.

#### **4.14.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3**

The effects to infrastructure and utilities under Alternative 3 would be identical for domestic water, wastewater, and fuel storage as those disclosed under Alternative 2. Guest services CCC would increase to 6,200 skiers under all action alternatives with construction of the Limestone Chalet. Because Alternative 3 does not include the expansion into the Slushman Drainage, there would be no S-1 or P-2 lifts. As a result, there would be a reduced increase in demand for electricity. Additionally, there would be no road necessary to the S-1 Lift for construction and maintenance access. Road construction under Alternative 3 would create approximately 1.1 miles of new roads.



#### 4.14.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

The effects to infrastructure and utilities under Alternative 4 would be identical for domestic water, wastewater, and fuel storage as those disclosed under Alternative 2. With no expansion into Bradley Meadow, the N-1 and P-3 lifts would not be constructed; however, the Limestone Chalet would remain part of the proposal. As a result, guest services CCC would increase to 6,200 skiers. There would be a reduced increase in demand for electricity at the resort as compared to Alternative 2. Additionally, there would be no road necessary to the N-1 Lift for construction and maintenance access. Road construction under Alternative 4 would create approximately 1.1 miles of new roads.

#### 4.14.5 FOREST PLAN CONSISTENCY

No Forest Plan standards or guidelines have been outlined for infrastructure and utilities either forest-wide or for MA 2. However, direction for facilities under MA 2 requires that new roads be constructed and maintained in accordance with management area goals. Implementation of the action alternatives would be consistent with this standard; therefore, the proposal would be consistent with Forest Plan direction.

## **4.15 NOISE**

The primary sources of existing noise at Bridger Bowl include traffic noise and other noises that are characteristic of ski resorts such as snowmaking, grooming, and avalanche hazard reduction. Increases in these factors as a result of the action alternatives would likely result in an overall increase in sound level energy in the Bridger Bowl area.

### **4.15.1 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 1**

Under Alternative 1, no change would be anticipated in the noise sources or levels at Bridger Bowl. The primary sources of noise at Bridger Bowl would remain maintenance activities, equipment operation, vehicular traffic, explosives used for avalanche hazard reduction and trail modifications, snowmaking activities, and recreational users of the facilities.

### **4.15.2 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 2**

Noise impacts at Bridger Bowl are not expected to increase appreciably with the proposed project elements under Alternative 2. Construction activities associated with the installation of the new lifts and ski trail development in the Slushman Drainage and the SF Bracket Creek Drainage would generate an increase in operational noise levels at Bridger Bowl; however, these would be temporary and short-term in nature. Increased levels of operation over the long term would be anticipated as a result of increased operational activities and traffic on local roadways.

### **Construction Impacts**

Under Alternative 2, noise associated with excavation and construction of new chairlifts, trails, and buildings would be the most noticeable impacts associated with the project. Typically during construction, there would be a temporary increase in noise impacts due to the use of heavy equipment and hauling of materials. Noise levels resulting from such construction would depend on the intensity of the construction activity (i.e., the amount and types of construction equipment being used) and the duration of the construction activity.

The types of equipment used for this project would typically generate noise levels between 80 and 90 dBA at a distance of 50 feet while equipment is operating. Construction equipment operation can vary from intermittent to fairly continuous, with multiple pieces of equipment operating concurrently. Assuming that two trucks (90 dBA), a scraper-grader (87 dBA), a moveable crane (82 dBA), a compactor/roller (73 dBA), and a tractor (85 dBA) are operating in the same area, peak construction-period noise would generally be about 93 dBA at 50 feet from the construction site.

Table 4.15-1 summarizes predicted construction noise levels at various distances from the construction site, conservatively assuming no atmospheric absorption or attenuation by trees and accounting for the attenuation of coniferous trees. Foliage and ground cover are assumed to provide attenuation of up to 14 dBA according to a study by the Forest

Service (Harrison, 1980). Daytime summer background noise levels in coniferous forest are typically 35-45 dBA (Harrison, 1980).

**Table 4.15-1**  
**Construction Noise Levels Near a Typical Construction Site**

Distance from Construction Site (ft)	Line-of-sight Noise Level (dBA)	Noise Level with Tree Attenuation (dBA)
50	93	93
100	87	75
200	81	69
400	75	61
800	69	55
1,600	63	49
3,200	57	43
6,400	51	37

Construction noise impacts would be localized and generally limited to daytime hours during the summer months. There would be no additional noise impacts in the surrounding areas during evening or nighttime hours. A helicopter may be used for installation of some chairlift towers. During this period, localized sound levels would be high relative to other times of the year. At the closest point, the Bridger Pines subdivision boundary is approximately 2,500 feet from the bottom terminals of the proposed A-1 and A-2 chairlifts. In this case, temporary daytime construction levels are estimated to be approximately 60 dBA at 2,500 feet. Those levels are higher than typical daytime background levels of 35-45 dBA. As a result, construction noise may be audible to property owners in the residential areas at the base of Bridger Bowl.

Big game and other wildlife could temporarily move to more quiet areas in the surrounding forestlands during the period of helicopter (or other construction) operations. It is unlikely that there would be any long-term adverse impact from this noise source (see Section 4.7–Wildlife).

### **Operational Impacts**

Operational activities under Alternative 2 would nominally increase noise levels at Bridger Bowl. Following build-out of the project, sounds would be similar to those that are currently experienced in the SUP area, including the operation of chairlifts, snow groomers, and vehicle traffic. Sound levels would be slightly elevated over existing conditions due to the more developed nature of the site. A doubling of sound energy (3 dBA) is generally considered the level of human perception. It is not expected that daytime operation levels will increase by more than 3 dBA with implementation of the project; therefore, no noticeable impact would be expected. The use of blasting for avalanche hazard reduction under all action alternatives would be similar in dBA and

duration to existing conditions, but it would likely be more frequent as a result of the expansion into the Slushman Drainage, which is prone to avalanche activity.

As disclosed under the discussions of air quality and transportation, an increase in vehicular traffic would be expected under all action alternatives. Though peak noise levels associated with traffic would likely remain constant, the duration of traffic related noise would likely increase slightly above current levels.

#### 4.15.3 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 3

Alternative 3 would be similar to Alternative 2 except that there would be no development in the Slushman Drainage. This equates to no construction of the S-1 and P-2 lifts and no development of the S-1 through S-4 trails. Additionally, there would be no increase in avalanche hazard reduction work at Bridger Bowl without the expansion into the Slushman Drainage. Therefore, noise impacts associated with the Alternative 3 would be less than those disclosed under Alternative 2.

#### 4.15.4 DIRECT AND INDIRECT EFFECTS OF ALTERNATIVE 4

Alternative 4 would be similar to Alternative 2 except that there would be no development in the SF Brackett Creek Drainage. This equates to no construction of the N-1 or P-3 lifts and no development of the N trails. There would be a slight increase in the use of blasting for avalanche hazard reduction in Alternative 4 as a result of the expansion into the Slushman Drainage, which is prone to avalanche activity, but it would be similar in dBA and duration in comparison to existing conditions. Noise impacts associated with the Alternative 4 would still be less than those disclosed under Alternative 2.

#### 4.15.5 FOREST PLAN CONSISTENCY

No Forest Plan standards or guidelines have been outlined for noise either forest-wide or for MA 2.

## **4.16 CUMULATIVE EFFECTS**

Cumulative effects are an aggregate of many direct and indirect effects and include actions, which have occurred in the past or can reasonably be expected to occur. For most resources, the Bridger Bowl Study Area is the primary scope of cumulative effects analysis. However, for soils, water resources, vegetation, wildlife, and fisheries, the scope has been broadened to accommodate the analysis needs of each resource (i.e., watershed, timber compartment, and Lynx Analysis Unit). The Forest Service has identified past (ten years), present, and reasonably foreseeable future actions within or adjacent to the study area; these are identified below, and a description of the potential cumulative impacts to each resource follows.

### **4.16.1 PRIVATE LAND DEVELOPMENT**

#### **Bridger Pines**

Bridger Pines is a housing development in the Bridger Creek watershed on private lands. Several home sites are still unoccupied and additional residential development may occur within the subdivision in the future.

#### **Bridger Park**

The Bridger Park subdivision was approved in April 1998 for 30 single-family dwellings (these homes sites are approximately 4.8 acres each), and there is approximately 117 acres of open space within the development.

#### **360 Ranch**

The 360 Ranch Corporation has submitted plans for the development of private lands to the south and east of the lands owned by Bridger Bowl, Inc. At the time of this publication, all plans have been withdrawn from consideration. As a result, this private land development is not considered a reasonably foreseeable future action.

#### **Bohart Ranch**

Bohart Ranch ski area is located on both private and NFS lands for which it has an SUP from the GNF. Some minor logging has occurred within the past ten years on both private and NFS lands for trail clearing. Additionally, the ranch has been put into a conservation easement. There is currently no future development planned on NFS lands in the area at this time.

#### **Bridger Bowl base area**

Since 1995, Bridger Bowl has completed several projects on its private lands to improve the existing conditions and meet the demands of today's skiers. These include expanding available parking from 900 to 1,300, installing a new wastewater treatment system, constructing a new ski patrol building adjacent to the Jim Bridger Lodge, and constructing a new Day Lodge. Also, a beginner lift (Snowflake) was constructed on

private lands adjacent to the lower portion of the Virginia City lift and additional snowmaking lines were installed near the Virginia City Lift expand the snowmaking coverage from 10 acres to 27 acres. Reasonable foreseeable future actions include development of additional parking in the base area, construction of the Limestone Chalet, and modification of the Virginia City Lift.

### **Incidental residential development**

Residential development is regulated by the Bridger Canyon Zoning Ordinance. Although there are numerous adjacent private land owners, future development would likely be limited to single-family dwellings on these properties.

### **Timber Harvests**

#### *Big Sky Lumber harvest*

Between 1993 and 1994, the Big Sky Lumber (BSL) Corporation conducted logging in sections 1 and 7 in the Slushman drainage within the Bridger Creek watershed. Over the duration of the project, approximately two million board feet were harvested.

#### *Timber harvests and grading projects within Bridger Bowl SUP*

Two timber harvests were completed for glade skiing, trail maintenance, and a free style jump site on NFS lands within the developed ski area between 1997 and 1999. Approximately 23,380 board feet were removed from 1.5 acres for the ski jump, and about 68,000 board feet were removed over a 61-acre area to improve glade skiing and maintain ski trails. Additionally, some grading occurred in 2001 when the Pierre's Knob Lift was realigned and the top terminal replaced; this project included removing about 132,000 board feet of timber from an area of about 10 acres.

### **Grazing Allotment**

#### *Brackett Creek allotment*

This grazing allotment is located north of Bridger Bowl in the Brackett Creek watershed on 5,072 acres, of which 2,236 are NFS lands. Grazing occurs from July 1 through October 15 annually and is allocated for 60 head of cattle. The current and projected utilization rate is 45 percent.

### **Brackett Creek Land Exchange**

An Environmental Assessment is being prepared to analyze the proposed land exchange of approximately 714 acres of private land and approximately 603 acres of NFS lands as part of the Brackett Creek Land Exchange. The purpose of the exchange is to reduce the number of isolated parcels of NFS lands land intermingled with private lands; ensure future public and administrative access to NFS; reduce trespass associated problems on private lands, and protect resource values on both acquired and conveyed lands. Upon completion of the land exchange, approximately six miles of public access roads will be



constructed or reconstructed providing public access in this area all on NFS lands. The private land owner has stipulated that development of the acquired land will result in a private family retreat with no more than six clustered residential homes and a barn. The analysis is expected to be completed by the end of 2004.

#### 4.16.2 GEOLOGY AND SOILS

The scale of the cumulative effects analysis for geology and soil is SF Brackett Creek Watershed and the Upper Bridger Creek Watershed. For the purpose of this analysis, the Upper Bridger Creek Watershed includes Upper Bridger Creek, Maynard Creek, and Slushman Creek. Cumulative effects on soils include the existing or baseline conditions described in Section 3.2 – Geology and Soils, those impacts associated with the Bridger Bowl SDEIS described in Section 4.2 – Geology and Soils, and other past, present, and reasonably foreseeable projects identified in the introduction to this cumulative effects section. These other projects include projects not associated with the Bridger Bowl SDEIS and have already, currently are, or are going to occur on lands within the SF Brackett Creek and Upper Bridger Creek Watersheds.

Due to the closely related processes between soil erosion, sediment yield to streams, and the resulting effects to water quality and fisheries, the cumulative effects analysis for these processes are not included in this section. Instead, impacts to these processes are analyzed in the water resources and fisheries sections where the impacts from soil erosion would likely occur. The cumulative effects analysis for soil is therefore focused on impacts to soil productivity in the SF Brackett Creek and Upper Bridger Creek Watersheds.

#### **Alternative 1**

With implementation of Alternative 1, no impacts would occur to geology and soil resources, so the only cumulative effects on soil productivity under Alternative 1 include the past, current, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur. According to analysis completed for the R1R4 sediment model, approximately 95.4 acres of productive soils in the SF Brackett Creek Watershed and the Upper Bridger Creek Watershed have been permanently impacted due to the past Bridger Bowl and other cumulative impacts of projects list in the beginning of this section. These past impacts to soil productivity represent approximately 1.6 percent of the land area in these watersheds. Since the soil productivity impacts from known future cumulative effects projects can not be accurately quantified, conservative estimates of permanent soil productivity impacts from proposed buildings, roads, and parking lots have been made. For the purposes of this analysis, it is assumed that future soil productivity impacts from the remaining lots at Bridger Pines subdivision would be approximately five acres, the Bridger Park subdivision would be approximately 30 acres, and 15 acres for potential road impacts from the Brackett Creek Land Exchange. Therefore, the cumulative effects to soil productivity from all known past, present, and reasonably foreseeable projects under Alternative 1 would be 145.4 acres, which is approximately 2.36 percent of the SF Brackett Creek and the Upper Bridger Creek Watersheds.

## **Alternative 2**

Under Alternative 2, approximately 7.0 acres of permanent impacts to soil productivity would occur within the SF Brackett Creek and Upper Bridger Creek Watersheds. In addition, approximately 57.3 of temporary clearing and grading impacts to soil productivity would occur. Since these impacts would be temporary in nature and the soil productivity would return to these sites over time, temporary soil productivity impacts are not considered in this cumulative effects analysis. The approximately 7.0 acres of permanent impacts to soil productivity proposed under Alternative 2 represent approximately 0.1 percent of the land area in these watersheds. The combined cumulative impacts from all past and future Bridger Bowl and other known projects under Alternative 2 would be 152.4 acres, which is approximately 2.47 percent of the SF Brackett Creek and the Upper Bridger Creek Watersheds.

## **Alternative 3**

Cumulative impacts on soil productivity in the SF Brackett Creek and Upper Bridger Creek Watersheds from Alternative 3 would be less than Alternative 2 because there would be no road or building construction in the Slushman Drainage. The total permanent impacts to soil productivity under Alternative 3 would be approximately 5.3 acres, which represents less than 0.1 percent of the SF Brackett Creek and Upper Bridger Creek Watersheds. The combined cumulative impacts from all past and future Bridger Bowl and other known projects under Alternative 3 would be 150.7 acres, which is approximately 2.45 percent of the SF Brackett Creek and the Upper Bridger Creek Watersheds.

## **Alternative 4**

Under Alternative 4, the cumulative impacts on soil productivity in the SF Brackett Creek and Upper Bridger Creek Watersheds would be less than Alternative 2 but more than Alternative 3 because there would be no road or building construction for the lifts and trails in the Bradley Meadows area but the construction in the Slushman Drainage would still occur. The total permanent impacts to soil productivity under Alternative 4 would be approximately 5.4 acres, which represents less than 0.1 percent of the SF Brackett Creek and Upper Bridger Creek Watersheds. The combined cumulative impacts from all past and future Bridger Bowl and other known projects under Alternative 3 would be 150.8 acres, which is also approximately 2.45 percent of the SF Brackett Creek and the Upper Bridger Creek Watersheds.

### **4.16.3 WATER RESOURCES**

The cumulative effects analysis of water resources presented below includes the following topics: stream channels, wetlands, water quantity, and water quality. The scale of the cumulative effects analysis for water resources is the SF Brackett Creek Watershed and the Upper Bridger Creek Watershed. For the purpose of this analysis, the Upper Bridger Creek Watershed includes Upper Bridger Creek, Maynard Creek, and Slushman Creek. Cumulative effects on waters resources include the existing conditions described

in Section 3.3 – Water Resources, those impacts associated with the Bridger Bowl SDEIS described in Section 4.3 – Water Resources, and other past, present, and reasonably foreseeable projects identified in the introduction to this cumulative effects section. These other projects include projects not associated with the Bridger Bowl SDEIS and have already, currently are, or are going to occur on lands within the SF Brackett Creek and Upper Bridger Creek Watersheds.

### **South Fork Brackett Creek Watershed**

#### *Alternative 1*

With implementation of Alternative 1, there would be no impacts to water resources, so there would be no additional direct impacts to stream channels or wetlands in the SF Brackett Creek watershed. The result of past projects on stream channels and wetlands are incorporated into the descriptions of existing stream channel and wetland conditions that are located in Section 3.3 – Water Resources. Since there would be no additional impacts to stream channels and wetlands under Alternative 1, the only cumulative effects on stream channels and wetlands under Alternative 1 would include the reasonably foreseeable projects described in the introduction to this section that would occur within the SF Brackett Creek Watershed. The Brackett Creek Grazing Allotment and the Brackett Creek Land Exchange have the potential to impact stream channels and wetlands in the future. However, the information that is currently available for these projects does not provide sufficient detail to determine specific impacts to stream channels and wetlands for this cumulative effects analysis. It is anticipated that any potential impacts to stream channels and wetlands from these projects would have minimal cumulative effects at the watershed scale because in-channel work would be performed in accordance with conditions of a 310 Permit from the MDEQ, any proposed wetland impacts would need a Section 404 permit from the U.S. Army Corps of Engineers, and any future work in a Stream Management Zone (SMZ) would follow all applicable mitigation measures and BMPs specified. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the SF Brackett Creek Watershed, there would be no cumulative impacts to stream channels or wetlands from implementation of Alternative 1.

Under Alternative 1, no construction activities would occur, so the only cumulative effects on water quantity would include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the SF Brackett Creek Watershed. Past timber harvest by Bohart Ranch is a cumulative effects project described in the introduction to this section that was incorporated into the water yield model. The Brackett Creek Grazing Allotment was not incorporated into the water yield model because grazing does not affect the variables in the model. No other past projects have been identified that would affect the water yield model. The only future project identified in the SF Brackett Creek watershed that could affect the water yield model is the Brackett Creek Land Exchange. This project was not incorporated into the water yield model because the information that is currently available for this project does not provide sufficient detail to be used in the model. Based on the assessment of the cumulative effects projects in the SF Brackett Creek watershed, the cumulative effects on

water quantity under Alternative 1 are adequately addressed by the water yield analysis of existing conditions in Section 3.3 – Water Resources. As stated in Section 3.3 – Water Resources, the annual water yield in SF Brackett Creek is currently 0.07 percent above natural conditions which reflects the limited amount of development in this watershed.

The R1R4 sediment model was used establish existing water quality conditions in a cumulative fashion accounting for all existing roads, timber harvest units, in the SF Brackett Watershed. The Brackett Creek Grazing Allotment was not included in the R1R4 sediment model because the model inputs are based primarily on land disturbance activities. The Brackett Creek Land Exchange is a future project in the SF Brackett Creek Watershed that could affect the R1R4 sediment model. However, this project was not incorporated into the sediment model because the information that is currently available for this project does not provide sufficient detail to be used in the model. No other reasonably foreseeable projects have been identified within the SF Brackett Creek Watershed that would affect the inputs in the R1R4 sediment model. Therefore, the analysis of cumulative effects on water quality in the SF Brackett Creek Watershed is adequately addressed by the R1R4 sediment model, which addresses the Proposed Action and other past projects at the watershed scale. The SF Brackett Creek sediment delivery rate is currently estimated at 8.2 percent over natural conditions with the existing road network. According to the 1999 MOU discussed in Chapter 3, the GNF sediment constraint for accelerated sediment delivery is 30 percent over natural conditions on an annual basis for the SF Brackett Watershed. The modeled sediment delivery rate for existing conditions is 8.2 percent over natural conditions for SF Brackett Creek. Therefore, the cumulative effects from all past Bridger Bowl and other projects within the SF Brackett Creek Watershed have resulted in sediment yields that are within the GNF standards for water quality.

#### *Alternatives 2 and 3*

The cumulative effects analysis for the SF Brackett Creek Watershed discusses alternatives 2 and 3 together because the potential impacts to water resources in this watershed would be identical for both alternatives. Under alternatives 2 and 3 there would be no new stream channel impacts from road crossings or other in-channel work in the SF Brackett Creek Watershed. Therefore, the cumulative effects to stream channels would be as described under Alternative 1.

Under alternatives 2 and 3 no grading or filling activities in wetlands are proposed, so the area and distribution of wetlands within SF Brackett Creek Watershed would remain unchanged. However, approximately 0.48 acres of direct impacts to wetlands would occur from vegetation removal. Implementation of mitigation measures VM-3, VM-4, and VM-6 avoid and/or minimize direct and incidental indirect impacts to wetlands. Since the proposed wetland impacts would not significantly affect the topography, hydrology source, or understory vegetation for these wetlands, implementation of Alternative 2 and 3 would not significantly affect wetland functions that can affect watershed process, such as surface water storage, sediment filtration, and moderation of groundwater flow. As stated above under Alternative 1, no known ongoing or reasonably foreseeable cumulative effects projects would impact wetlands in the SF Brackett Creek

Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the SF Brackett Creek Watershed, it is likely that the site scale clearing impacts to wetlands proposed under alternatives 2 and 3 would not result in cumulative impacts to wetlands or water quantity or quality in the SF Brackett Creek Watershed.

The forest clearing and road building activities proposed under alternatives 2 and 3 would increase water yield in SF Brackett Creek Watershed by 1.0 percent above natural conditions, which is 0.8 percent above existing conditions. The projected increase in water yield above existing conditions is considered too small to be measurable at the watershed scale. Therefore, alternatives 2 and 3 would not change the water yield enough to create any additional channel scour or other impacts to streams. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase water yields in SF Brackett Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the SF Brackett Creek Watershed, there would be no cumulative impacts to water yield from implementation of alternatives 2 and 3 other than the impacts previously disclosed for these alternatives.

The maximum sediment delivery due to construction activities proposed under alternatives 2 and 3 is estimated to increase delivery rates by 1.6 tons per year, which is 1.8 percent above existing conditions and 10.1 percent over natural conditions. The sediment increase in SF Brackett Creek would decrease to 8.4 percent over natural rates by 2011. The modeled sediment delivery rate for alternatives 2 and 3 for SF Brackett Creek is well below the 30 percent standard set by the GNF to meet conditions for Class A streams and the 1999 MOU. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase sediment delivery to the SF Brackett Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the SF Brackett Creek Watershed, there would be no cumulative impacts to water quality from implementation of alternatives 2 and 3 other than the impacts previously disclosed for these alternatives.

#### *Alternative 4*

There would be no direct or indirect impacts to stream channels, wetlands, water quantity, or water quality in the SF Brackett Creek Watershed as a result of project implementation under Alternative 4. Therefore, the only cumulative effects on water resources under Alternative 4 include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the SF Brackett Creek Watershed. The cumulative effects of these projects are presented above in the analysis for Alternative 1.

## Upper Bridger Creek Watershed

### *Alternative 1*

With implementation of Alternative 1 there would be no impacts to water resources, so there would be no additional direct impacts to stream channels or wetlands in the Upper Bridger Creek Watershed. Since there would be no additional impacts to stream channels and wetlands under Alternative 1, the only cumulative effects on stream channels and wetlands under Alternative 1 would include the reasonably foreseeable projects described in the introduction to this section that would occur within the Upper Bridger Creek Watershed. The residential developments that may occur within the Bridger Pines subdivision and the Bridger Park subdivision have the potential to impact stream channels and wetlands in the future. However, the information that is currently available for these projects does not provide sufficient detail to determine specific impacts to stream channels and wetlands for this cumulative effects analysis. It is anticipated that any potential impacts to stream channels and wetlands from these projects would have minimal cumulative effects at the watershed scale because in-channel work would be performed in accordance with conditions of a 310 Permit from the MDEQ, any proposed wetland impacts would need a Section 404 permit from the U.S. Army Corps of Engineers, and any future work in a Stream Management Zone (SMZ) would follow all applicable mitigation measures and BMPs specified. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to stream channels or wetlands from implementation of Alternative 1.

Since no construction activities would occur under Alternative 1, the only cumulative effects on water quantity in the Upper Bridger Creek Watershed would include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS. Past timber harvest for the Bridger Pines subdivision, the Big Sky Lumber Harvest, and timber harvest and road building in the Bridger Bowl Base Area were incorporated into the water yield model. No other past projects have been identified that would affect the water yield model. The only future project identified in the Upper Bridger Creek Watershed that could affect the water yield model is the Bridger Park Subdivision and final build-out of the Bridger Pines subdivision. These projects were not incorporated into the water yield model because these project areas already have a high density of roads and sparse forest cover and so additional timber harvest and road building in these areas may not be measurable by the water yield model. In addition, the information that is currently available for these projects does not provide sufficient detail to be used in the model. Based on the assessment of the cumulative effects projects in the Upper Bridger Creek Watershed, the cumulative effects on water quantity under Alternative 1 are adequately addressed by the water yield analysis of existing conditions in Section 3.3 – Water Resources. Developments in these watersheds have increased current water yield to an estimated 0.7 percent in Maynard Creek, 0.6 percent increase in Slushman Creek, and 0.3 percent in Upper Bridger Creek. Peak snowmelt runoff discharge in Maynard Creek is likely greater than the model predicts since the existing watershed developments are more efficient at conveying overland flow to the stream system.



Under Alternative 1, no Bridger Bowl MDP impacts would occur, so the only cumulative effects on water quality under Alternative 1 include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the Upper Bridger Creek Watershed. All of the known cumulative effects projects that have occurred in the recent past were incorporated into the R1R4 sediment yield analysis, including recently completed development in the Bridger Bowl Base Area, timber harvest by Bridger Bowl for trail development, past Bridger Pines development, and the Big Sky Lumber Harvest. The reasonably foreseeable projects identified within the Upper Bridger Creek Watershed are primarily small residential development projects in the Bridger Park subdivision and the remaining undeveloped home sites in the Bridger Pines subdivision. The future development of single family homes in these subdivisions would not likely result in measurable sediment yield impacts to the Upper Bridger Creek Watershed because of the small size, and staggered timeframe of the housing sites. In addition, these development projects will have to follow the provisions of the Montana Streamside Protection Act, included observation of the 50 foot-wide Stream Management Zones.

Since the known reasonably foreseeable projects that have been identified within the Upper Bridger Creek Watershed are not likely to affect the R1R4 sediment model, the analysis of cumulative effects on fisheries in the Upper Bridger Creek Watershed is adequately addressed by the sediment model, which addresses the impacts of the action alternatives and other past projects at the watershed scale. The three tributaries to the mainstem of Bridger Creek analyzed by the R1R4 sediment model do not have any documented fish presence and are all considered Class D streams by the GNF. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates. According to estimates from the R1R4 model, the existing sediment yield to the three tributaries to the mainstem of Bridger Creek range from 27 to 77 percent above natural conditions. Therefore, the cumulative effects from all past Bridger Bowl and other projects within the Upper Bridger Creek Watershed have resulted in sediment yields that are within the GNF standards for Class D streams.

### *Alternative 2*

Under Alternative 2, there is a proposed stream crossing for a new road that would be located in the Slushman Drainage. Mitigation measure RP-1 in Table 2.6-1 would minimize potential channel impacts and indirect sediment impacts. In addition, a list of required BMPs and agency guidelines are included in the Implementation and Monitoring Plan in Appendix D of this document. Based on proper implementation of the mitigation measures and BMPs and the lack of documented fish presence and habitat in this portion of Slushman Creek, it is unlikely that the proposed road crossing would have any measurable effects to channel morphology or integrity at the watershed scale. As stated above under Alternative 1, no known ongoing or reasonably foreseeable cumulative effects projects would impact stream channels in the Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, it is likely that the site scale channel impacts in Slushman Creek proposed under Alternative 2 would not result in

cumulative impacts to stream channels or water quality in the Upper Bridger Creek Watershed.

Under Alternative 2 there would be no new wetland impacts from road building or lift and trail construction in the Upper Bridger Creek Watershed. Therefore, the cumulative effect to wetlands in the Upper Bridger Creek Watershed would be as described under Alternative 1.

The forest clearing and road building activities proposed under Alternative 2 would increase water yield in the three tributaries to the mainstem of Bridger Creek in a range from 0.2 percent to 1.0 percent above natural conditions, which is 0.1 percent to 0.8 percent above existing conditions.. The projected increase in water yield above existing conditions is considered too small to be measurable at the watershed scale. Therefore, Alternative 2 would not change the water yield enough to create any additional channel scour or other impacts to streams. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase water yields in Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water yield from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

The maximum sediment delivery due to construction activities proposed under Alternative 2 is estimated to increase delivery rates to the three tributaries to the mainstem of Bridger Creek by 1.5 to 3.5 tons per year, which is 28.4 to 83.9 percent over natural conditions. Increases in sediment yield as a result of activities proposed under Alternative 2 would not exceed the 100 percent above natural rates guidelines of the GNF. Therefore, this level of sediment delivery within Upper Bridger Creek Watershed would have extremely limited, if any, negative effect on water quality. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase sediment delivery to the Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water quality from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

### *Alternative 3*

Under Alternative 3 there would be no new stream channel or wetland impacts from road crossings or lift and trail construction in the Upper Bridger Creek Watershed. Therefore, the cumulative effect to stream channels and wetlands in the Upper Bridger Creek Watershed would be as described under Alternative 1.

The projected increases in water yield as a result of activities proposed under Alternative 3 would be the same as Alternative 2 for Maynard and Upper Bridger Creeks. The projected increases in water yield in Maynard and Upper Bridger Creeks would only be considered too small to be measurable. No construction activities are proposed in the Slushman watershed under Alternative 3, so there would be no new impacts to water

yield in Slushman Creek. Similar to Alternative 2, Alternative 3 would not change the water yield enough to create any additional channel scour or other impacts to streams. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase water yields in Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water yield from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

Sediment delivery impacts to Maynard and Upper Bridger Creeks under Alternative 3 would be the same as in Alternative 2. Under Alternative 3 there would be no increase in sediment delivery to Slushman Creek. Since the increases in sediment delivery under Alternative 3 would be the same as or less than Alternative 2, sediment delivery under Alternative 3 would not exceed the 100 percent above natural rates guidelines of the GNF. Therefore, this level of sediment delivery within Upper Bridger Creek Watershed would have extremely limited, if any, negative effect on water quality. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase sediment delivery to the Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water quality from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

#### *Alternative 4*

Under Alternative 4 there would be one new stream channel crossing in the Upper Bridger Creek Watershed for the proposed road that is needed to access the proposed S-1 chairlift. The potential stream channel impacts under Alternative 4 would be the same as proposed under Alternative 2, so the cumulative impacts to stream channels in the Upper Bridger Creek Watershed would be as described under Alternative 2.

Under Alternative 4 there would be no new wetland impacts from road building or lift and trail construction in the Upper Bridger Creek Watershed. Therefore, the cumulative effect to wetlands in the Upper Bridger Creek Watershed would be as described under Alternative 1.

The forest clearing and road building activities proposed under Alternative 4 would increase water yield in the three tributaries to the mainstem of Bridger Creek in a range from 0.1 percent to 0.2 percent above existing conditions. The projected increase in water yield above existing conditions is considered too small to be measurable at the watershed scale. Therefore, Alternative 4 would not change the water yield enough to create any additional channel scour or other impacts to streams. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase water yields in Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water yield from

implementation of Alternative 4 other than the impacts previously disclosed for this alternative.

Sediment delivery impacts to Slushman Creek under Alternative 4 would be the same as in Alternative 2. Under Alternative 3 sediment delivery to Maynard and Upper Bridger Creeks would be less than under Alternative 2 with an increase of 1.3 tons per year and 2.4 tons per year respectively. Since the increases in sediment delivery under Alternative 4 would be the same as or less than Alternative 2, sediment delivery under Alternative 4 would not exceed the 100 percent above natural rates guidelines of the GNF. Therefore, this level of sediment delivery within Upper Bridger Creek Watershed would have extremely limited, if any, negative effect on water quality. As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase sediment delivery to the Upper Bridger Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to water quality from implementation of Alternative 4 other than the impacts previously disclosed for this alternative.

#### 4.16.4 VEGETATION

The scale of the cumulative effects analysis for vegetation includes Timber Compartments 504 and 515 and is referred to as the FAA (FAA). Cumulative effects on vegetation include the existing or baseline conditions described in Section 3.4 – Vegetation, those impacts associated with the Bridger Bowl SDEIS described in Section 4.4 – Vegetation, and other past, present, and reasonably foreseeable projects identified in the introduction to this cumulative effects section. These other projects include projects not associated with the Bridger Bowl SDEIS and have already, currently or may occur on lands within the FAA.

##### **Alternative 1**

With implementation of Alternative 1, no impacts would occur to vegetation, so the only cumulative effects would include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the FAA and are described in the introduction to this section. All of the known cumulative effects projects that have occurred in the recent past were incorporated into the fragmentation and old growth analysis used to analyze the impacts of the alternatives, including recently completed development in the Bridger Bowl base area, timber harvest by Bridger Bowl on NFS Lands for trail development, and the Big Sky Lumber Harvest. The Brackett Creek Grazing Allotment is an ongoing and reasonably foreseeable project that would not affect forest fragmentation or existing old growth because cattle grazing typically affects herbaceous and shrub vegetation. The reasonably foreseeable projects identified within the FAA are primarily small residential development projects located in currently fragmented areas based on interpretation of aerial photographs and GIS data. Therefore, forest fragmentation is expected to remain in a condition similar to those described in Chapter 3.4-Vegetation in the foreseeable future.

No changes to old growth forests are likely to occur from any other future private or public actions within the next 5 to 10 years in the FAA. Over time, some increases in the dead and down woody component will occur. The additional down debris is expected to add to understory complexity and low level vertical structure. Additionally, it is likely that the amount of old growth forest would increase in the FAA over the long term because large portions of mature forests within these compartments would be allowed to grow into old growth forest.

## **Alternative 2**

The proposed activities under Alternative 2 in the Bradley Meadows area would fragment a portion of the second largest interior forest patch in the FAA. This interior forest patch would change from an existing area of 832 acres to two smaller patches of 413 acres and 182 acres (Novak, 2003). The proposed activities under Alternative 2 would reduce interior forest within the FAA from 35 percent to 33 percent (Novak, 2003). As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase forest fragmentation because all known future projects would occur in areas that are currently fragmented. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the FAA, there would be no additional impacts to forest fragmentation from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

Under Alternative 2, there would be approximately 17.1 acres of old growth impacts from forest clearing within the FAA. The impacts to old growth forest proposed under Alternative 2 would reduce the amount of old growth in FAA from approximately 1,464 acres to 1,447 acres, which represents a 1.2 percent change from existing conditions. No other changes to old growth forests are likely to occur from any other future private or public actions within the next 5 to 10 years in FAA. Because of past harvests in old growth and conditions present on the east side of the Bridger Mountains, existing old growth amounts in Timber Compartment 504 are below the Forest Plan standard of 10 percent. Even though this compartment is under the standard, the amount of proposed old growth forest clearing is slight in relation to the amount of old growth forest remaining in the FAA. Many of the stands identified as mature will gradually progress into old growth over time. However, it will take another 30 to 40 years for much of the mature forest that exists in the Bridger Mountains to grow into old growth. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the FAA, there would be no cumulative impacts to old growth from implementation of Alternative 2 other than the impacts previously disclosed for this alternative.

## **Alternative 3**

The overall impacts to vegetation communities within the FAA under Alternative 3 would be less than Alternative 2 because there would be no development in the Slushman Drainage. However, the fragmentation impacts from Alternative 3 would be identical to those from Alternative 2 because all of the impacts to interior forest patches occur in the Bradley Meadows area. Similar to Alternative 2, the interior forest patch in the Bradley Meadows area would change from an existing area of 832 acres to two smaller patches of

413 acres and 182 acres under Alternative 3 (Novak, 2003). Since the known past, present, and reasonably foreseeable projects would be the same under Alternative 3, there would be no cumulative impacts to forest fragmentation from implementation of Alternative 3 other than the impacts previously disclosed for this alternative.

Similar to the fragmentation impacts, the impact to old growth under Alternative 3 would be identical to Alternative 2. Since the known past, present, and reasonably foreseeable projects would be the same under Alternative 3, there would be no cumulative impacts to old growth from implementation of Alternative 3 other than the impacts previously disclosed for this alternative.

#### **Alternative 4**

Alternative 4 would not effect the fragmentation of interior forest in the FAA because the actions proposed would not alter interior forest in the Bradley Meadows or Slushman drainage areas. Since there would be no cumulative impacts to forest fragmentation from known past, present, and reasonably foreseeable projects, implementation of Alternative 4 would not result in any cumulative impacts to forest fragmentation.

Activities proposed under Alternative 4 would impact approximately 0.1 acres of old growth forest. The impacts to old growth forest proposed under Alternative 2 would reduce the amount of old growth in FAA by approximately 0.01 percent from existing conditions. Implementation of Alternative 4 would not result in any cumulative impacts to old growth because the proposed impacts to old growth under Alternative 4 are nearly immeasurable at the FAA scale and there are no known cumulative impacts from known past, present, and reasonably foreseeable projects.

#### **4.16.5 WILDLIFE**

Cumulative effects on wildlife include the existing or baseline conditions described in Section 3.5 – Wildlife, those impacts associated with the Bridger Bowl SDEIS, and other past, present, and reasonably foreseeable projects identified at the beginning of this section. These other projects include projects not associated with the Bridger Bowl SDEIS that have already, currently are, or are going to occur on lands within the various analysis areas used for the different animal species analyzed in this section.

Cumulative effects for wildlife species are analyzed at different scales depending on the range for each species. The analysis area for Canada lynx is the South Bridger Lynx Analysis Unit (SB LAU). The analysis area for wolverine is the Wolverine Analysis Area. The Bridger Range, which is approximately 84,480 acres, comprises the analysis area for the following species: bald eagle, gray wolf, peregrine falcon, flammulated owl, black-backed woodpecker, northern goshawk, western big-eared bat, pine marten, elk, mule deer, white-tailed deer, moose, mountain goat, black bear, mountain lion, blue grouse, ruffed grouse, and boreal owl. The Bridger Creek and Brackett Creek watersheds comprise the analysis area for the northern leopard frog and the boreal toad.



## Threatened Species

### *Canada lynx (Lynx canadensis)*

The analysis area for the Canada lynx is comprised of the SB LAU which covers approximately 18,293.85 acres and contains approximately 12,159 acres of lynx habitat (see Figure 3-5). The SB LAU is sufficiently large enough to cover the average home range size of a female lynx and it contains adequate habitat to support lynx on a year-round basis.

#### Denning Habitat

Cumulative effects to lynx denning habitat include past timber harvest, ski area and housing development, plus associated road building, which have removed or degraded lynx denning habitat. Effects from timber harvest for wood production are temporary, and if left to natural succession, harvest units can be expected to grow back to a condition where they again provide denning habitat. Effects of ski area and housing development are permanent. Most of the lynx habitat on private land in the base area has already been managed to some degree, to the point where it no longer provides high quality denning habitat. Development in the base area has affected less than 1 percent of the suitable denning habitat in the SB LAU. Most of the lynx denning habitat in this LAU is located on federal lands. Private lands account for only approximately 367 acres of lynx denning habitat at this time. There is potential for timber harvest and housing development on private lands to have additional effects on lynx denning habitat. However, given the small amount of denning habitat currently available on private lands, the associated risk for additional impact is considered to be low at this time, and federal lands could easily continue to provide the minimum of 10 percent denning habitat required in the Lynx Conservation Strategy (LCS).

Currently, there are 2,621 acres of lynx denning habitat available within the LAU. Under Alternative 1, there would be no additional cumulative effects to lynx denning habitat as there would be no new development at Bridger Bowl. Lynx denning habitat available within the LAU would remain at 2,621 acres.

Under Alternative 2, lynx denning habitat would decrease by approximately 288.7 acres resulting in a decrease of 11 percent in the amount of denning habitat available in the LAU.

Under Alternative 3, lynx denning habitat would decrease by approximately 193.5 acres resulting in a decrease of 7.4 percent in the amount of denning habitat available in the LAU.

Under Alternative 4, lynx denning habitat would decrease by approximately 95.2 acres resulting in a decrease of 3.6 percent in the amount of denning habitat available in the LAU.

### Foraging Habitat

Cumulative effects to foraging habitat are primarily associated with the ski area and housing development in this LAU. These types of activities result in a permanent loss of lynx foraging habitat, since lands cleared for development are typically not allowed to regenerate into a condition suitable for snowshoe hare habitat. Past timber harvest is primarily responsible for producing lynx foraging habitat. Since foraging habitat is generally comprised of young and/or small diameter trees that have no commercial timber value, it is not likely that there would be additional impacts to existing lynx foraging habitat due to commercial timber harvest. Timber management strategies often involve pre-commercial thinning of young coniferous stands to improve the growth and production of wood for future harvest. There are no corporate timber lands remaining in the SB LAU and individual private landowners are not likely to incur the investment required for pre-commercial thinning.

With all of the action alternatives, only krummholtz (high elevation, wind stunted) foraging habitat would be affected. Small amounts of this habitat would be removed or otherwise impacted by these alternatives, in all cases resulting in less than one percent change for available foraging habitat. Further, under all alternatives, some currently unsuitable habitat created by recent timber harvest outside the ski area boundary would be expected to naturally regenerate to a condition where it produces high quality lynx foraging habitat within 15 to 20 years post-harvest.

The Bostwick fire of 1991 burned on the west side of the Bridger Ridge, adjacent to the SB LAU. Intense fire suppression efforts kept this fire from jumping the ridge and burning into the SB LAU, and thus precluded the potential development of additional lynx foraging habitat. The land exchange in progress for the Brackett Creek area would result in the Forest Service acquiring a slight net gain in lynx habitat, including some small recent harvest areas that should produce good foraging habitat in the next 10 to 15 years. Most of the lynx habitat traded into private ownership with this exchange is currently in a condition suitable for lynx, but not providing good denning or foraging habitat.

Currently, there are 2,241 acres of lynx foraging habitat available within the LAU. Under Alternative 1, there would be no additional cumulative effects to lynx foraging habitat as there would be no new development at Bridger Bowl. Lynx foraging habitat available within the LAU would remain at 2,241 acres.

Under Alternative 2, lynx foraging habitat would decrease by approximately 30.5 acres resulting in a decrease of 1.4 percent in the amount of foraging habitat available in the LAU.

Under Alternative 3, lynx foraging habitat would decrease by approximately 27.6 acres resulting in a decrease of 1.2 percent in the amount of foraging habitat available in the LAU.

Under Alternative 4, lynx foraging habitat would decrease by approximately 2.9 acres resulting in a decrease of 0.1 percent in the amount of foraging habitat available in the LAU.

### Connectivity

Cumulative effects to habitat connectivity include past timber management activities, plus ski area and housing development on federal and private lands, which all have contributed to the existing degree of forest fragmentation in this LAU. The location of the Bridger Bowl in the middle of the LAU (see Figure 3-5), with many previously forested areas cleared for skiing facilities, has resulted in a continuous break in lynx habitat connectivity from the lower slopes to the ridge top in this landscape. Much of the recently (within the past 20 years) harvested forest habitat on federal land outside the ski area is starting to regenerate and should eventually progress to reconnect lynx habitat in the LAU. Timber harvest on private lands has mainly involved selective cutting in which some mature trees are left standing. These selective cuts continue to provide habitat connectivity for lynx but do not afford good denning or foraging habitat. Additional cumulative impacts could occur through potential future development of additional ski lifts, runs, roads and facilities on private lands in the base area. Most of this development would likely take place in lynx habitat that is currently suitable for travel or resting, but does not presently provide high quality denning or foraging habitat. There is potential for timber management and housing development on private land to further degrade landscape connectivity for lynx in this LAU.

When planning new or expanding recreational developments, the LCS requires that connectivity within linkage areas is maintained (McAllister 2002). Linkage areas are defined as habitat that provides landscape connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas where blocks of lynx habitat are separated by intervening areas of non-lynx habitat such as basins, valleys, agricultural lands or where lynx habitat naturally narrows between blocks. Connectivity provided by linkage areas can be degraded or severed by human infrastructure such as high-use highways, subdivisions, or other developments (McAllister 2002).

The linkage area concept is intended to identify areas important for lynx to move within or between blocks of habitat, and to maintain the integrity of such connecting areas so that no permanent barriers to lynx movement result from federally authorized actions. Since the Bridger Range is an isolated block of lynx habitat, linkage areas are important for maintaining the connectivity of this area with other blocks of habitat. Potential linkage areas for lynx have been identified to maintain connective habitat between the Bridger Range and surrounding blocks of lynx habitat including the Gallatin and Madison Ranges to the south, the Crazy Mountains to the east, and the Big Belt Mountains to the north.

Cumulative effects to linkage areas primarily result from residential development in the valley lands surrounding the Bridger Range. Resort development on private land within and adjacent to Bridger Bowl could encourage additional development on other private land in the area. This type of high-density development on private land has the potential

to degrade or fragment habitat connectivity in linkage areas. The Forest Service is in the process of completing a land exchange with private landowners in the Brackett Creek area of the LAU. This project involves transfer of properties including lynx habitat as well as adjacent linkage area. The Forest Service stands to gain a slight net increase in lynx habitat within the LAU, and would receive about an equal exchange of connecting habitat in the linkage area along Highway 86. The potential for this land exchange to contribute cumulative effects to linkage areas comes from the consolidation of private lands resulting from the exchange. Unifying the private property and removing the inclusion of public land improves the potential for development. The current landowner involved in the exchanged has expressed no interest in developing the affected land beyond the level necessary to accommodate immediate family. Additional cumulative effects may be incurred through development of other private lands in the linkage areas.

Interstate 90 runs past the SB LAU on the south end. This four-lane highway, a parallel railway and frontage road, have been identified as an impediment to wildlife movement (Craighead et al. 2002:2). I-90 bisects an area currently identified as linkage habitat for lynx. State route 86 (Bridger Canyon Road), which also affects linkage habitat, runs up through the LAU and provides access to the Bridger Bowl. Wildlife mortalities (though no lynx to date) do result from collisions with vehicles on Bridger Canyon Road; however, this highway does not currently pose a serious impediment to wildlife movement.

Alternative 1 would have no effect on linkage areas; therefore, there would be no cumulative effects associated.

Alternative 2 would impact lynx habitat and connectivity within the SB LAU as described above, but would have no direct effect on the non-lynx habitat identified as potential linkage areas surrounding the Bridger Mountain Range.

Alternative 3 would again have no direct effects on non-lynx habitat in linkage areas, but would have the same indirect and cumulative effects as described for Alternative 2.

Like the other two action alternatives, Alternative 4 would have no direct effects on linkage habitat.

#### *Bald eagle (Haliaeetus leucocephalus)*

Major activities that take place in the winter in the Bridger Range include motorized and non-motorized recreation in the form of snowmobiling and skiing/snowshoeing respectively, housing development and associated road building, and possibly winter timber harvest and associated road building. The most notable contribution to cumulative effects to bald eagles would be in the form of increased traffic and thus potential for road kills. Expanding urbanization of the Bridger Canyon area, increased winter recreation (snowmobiling and back-country skiing/snowshoeing), and increased skier capacity associated with the proposed expansion of Bridger Bowl would contribute to more traffic on Highway 89, which could result in greater numbers of road-killed wild and domestic animals. Bald eagles commonly feed on carrion from road-killed animals, which could

increase the potential for bald eagle collisions with vehicles. Bald eagle presence in the Bridger Range is typically limited to pass-through migrants due to the lack of available nesting and large bodies of water for foraging; although they will feed on carrion when it is available. The Proposed Action is not expected to result in significant cumulative effects to bald eagles.

### **Proposed Species**

#### *Gray wolf (Canis lupus)*

The overall effect of the Bridger Bowl expansion on gray wolf populations would be minimal. Wolves use a variety of habitat types and appear to select habitat based upon prey availability. Big game populations in the GNF are considered stable and provide the primary source of prey for gray wolves. The Proposed Action would likely increase the amount of deer and elk foraging habitat within the Study Area resulting in a potential increase in use of the area by big game. However, ski area activities would be restricted to the winter months so big game summer range would not be adversely impacted by the Proposed Action (Pac, Pers. Comm., 1996). For these reasons, the Proposed Action is not expected to result in significant cumulative effects to gray wolves.

### **Forest Service Sensitive Wildlife Species**

#### *Peregrine falcon (Falco peregrinus)*

Cumulative impacts to peregrine falcons from activities within the Bridger Range would be minimal. This determination is based on the limited presence of peregrines in the area. Recent efforts to restore peregrine falcon populations in the United States have met with great success and although it is expected that peregrine populations will continue to expand, the Bridger Range will not likely be selected for nesting and/or foraging habitat by peregrines as readily as other available habitat on the GNF due to the lack of major water sources (e.g., large rivers or lakes).

#### *Flammulated owl (Otus flammeolus)*

Flammulated owls are known to occur on the west side of the Bridger Range, where dry, open Douglas fir forests are more prevalent, approximately 12 miles from the Study Area. Timber harvests in the Bridger Range would reduce the available habitat for flammulated owls. Housing developments could permanently reduce nesting and/or foraging habitat for this species.

#### *Black-backed woodpecker (Picoides arcticus)*

Timber harvest, housing development, and road construction would impact potential nesting and foraging habitat for black-backed woodpecker. The degree of urbanization of the Bridger Range makes this area a high priority for fire suppression efforts. However, prescribed fire may be used in the Bridger Mountains to reduce fuel loading in urban interface areas, improve range conditions for livestock and wildlife, and to reintroduce fire into the ecosystem. These prescribed burns would create additional suitable habitat

for black-backed woodpeckers. With little suitable habitat currently available in the Bridger Range, and limited potential for habitat improvement with prescribed fire overall, the cumulative effects will have no impact on black-backed woodpeckers.

#### *Wolverine (Gulo gulo)*

For analysis purposes, an area roughly the size of the average home range for a female with young was delineated around the Study Area (see Figure 3-6). The Wolverine Analysis Area for this project includes timber compartments 504 and 515 plus sub compartments 503 - 04, 05, 06 and 07. This area was chosen because it is of sufficient size (34,418 acres) to contain the average home range of a female wolverine with young and contains all activities associated with the Proposed Action. The Wolverine Analysis Area spans both sides of the Bridger Range, with about half the acreage located on the east side where better denning habitat occurs, and the other half on the west side, where big game winter range could provide winter/denning season food sources in the form of ungulate carcasses. Approximately 8 percent (2,588 acres) of the analysis area contains suitable denning habitat for wolverines.

Cumulative effects to wolverines are primarily a result of habitat alterations, access route densities, and human-caused mortality. Within the ski area boundary, habitat has been altered through the removal of forest cover to create openings for ski runs, roads, etc; thinning of mature forest to open up areas for glade skiing; and removal of brush, snags, logs and lower branches to provide for skier safety. Elsewhere in the Wolverine Analysis Area, habitat alterations have occurred as a result of timber harvest, forest thinning, and wildfire. Removal of forest cover, thinning forested areas, and reduction of brush, woody debris and lower branches reduces available security cover for wolverines. Hiding cover protects wolverines, particularly the young, from other predators, and also provides habitat for various prey species.

Road and trail densities affect wolverines indirectly by facilitating human access, which can then have disturbance and/or displacement effects, or result in direct mortality of wolverines. Human presence can affect wolverine behavior patterns, and can potentially influence prey distribution. The primary cause of human-related wolverine mortality is trapping (Banci, 1994), which is directly affected by access into wolverine habitat. Effects to wolverines from human land uses and associated access are expected to be similar to effects of such activities on grizzly bears (Banci, 1994). The Grizzly Bear Management Plan for Southwestern Montana recommends managing open road densities at 1 mile per square mile or less in grizzly bear habitat (IGBC, 2003). Open road densities are currently below this level at 0.96 miles per square mile within the Wolverine Analysis Area, but would vary by alternative upon implementation as discussed in Chapter 4. A potential future action that could have cumulative effects to wolverines involves the acquisition of public access and potential trail development just south of Bridger Bowl. This possible change is identified in the Gallatin National Forest Travel Planning Benchmark (2002) and could facilitate substantial increases in human activity in the area south of Bridger Bowl. This area is currently land-locked by private land, and consequently receives little human use.



Wolverines potentially use the Bridger Range as a travel/dispersal corridor, as evidenced by genetic similarities between the Gallatin subpopulation of wolverines (which includes animals in the Bridger Range) with the Rocky Mountain Front subpopulation (Cigelski, 2002). High levels of forest fragmentation could compromise the integrity of the travel corridor currently provided on the east side of the Bridger Range. Forested habitat is still largely intact on the west side of the range and could continue to provide a relatively secure travel route.

Alternative 1 involves continuing permitted actions within the existing ski area boundary, with no new development and no expansion on national forest lands. Therefore, there would be no additional degradation of wolverine habitat within the Wolverine Analysis Area by ski area activities.

Cumulative effects to wolverines under Alternative 2 would include fragmentation of a portion of a large block of mature forest in the north expansion area. This fragmentation would further degrade habitat in the Wolverine Analysis Area that contains some of the most fragmented forested habitat on the Gallatin Forest (see Biodiversity discussion in section 3.4). Ski area features are a permanent encumbrance on the landscape, thus perpetuating forest fragmentation effects for many generations of wolverines. Under the Proposed Action approximately 276 acres of wolverine denning habitat would be impacted, resulting in a 10.6 percent decrease in the amount of available denning habitat within the Wolverine Analysis Area.

Cumulative effects under Alternative 3 would be similar to those described for Alternative 2, and would be primarily associated with continued habitat alteration and disturbance in high quality wolverine denning habitat and additional forest fragmentation. Under Alternative 3, approximately 202 acres of wolverine denning habitat would be impacted, resulting in a 7.8 percent decrease in the amount of available denning habitat within the Wolverine Analysis Area.

Cumulative effects under Alternative 4 would be similar to those described for Alternative 1, since this alternative does not involve the degree of forest fragmentation that would occur under alternatives 2 and 3. Under Alternative 4, approximately 74 acres of wolverine denning habitat would be impacted, resulting in a 2.8 percent decrease in the amount of available denning habitat within the Wolverine Analysis Area.

#### *Northern goshawk (Accipiter gentilis)*

Cumulative effects to goshawks and their habitat in the Bridger Range would occur from timber harvest, prescribed burning, housing development and road construction. Removal of mature to old-growth forest through any of these practices would reduce overall potential goshawk nesting habitat in the Bridger Range. Removal of trees, snags, brush and/or down woody debris through such activities could also impact foraging habitat for goshawks. However, it should be noted that selective timber harvest and prescribed burning could also improve goshawk foraging habitat by increasing habitat for prey species such as rabbits and hares and by opening up the understory in forested areas, thereby improving conditions for hunting prey.

### *Western big-eared bat (Corynorhinus townsendi)*

The greatest concern over impacts to western big-eared bats involves loss and/or disturbance of suitable roosting habitat (Tuttle, 1979; McCracken, 1988). Degradation of foraging habitat could also have negative effects on bat populations (Pierson, 1988). Due to the lack of suitable roosting habitat in the Study Area, and very minimal degree of disturbance to potential foraging habitat, there would be no impact to the western big-eared bat under alternatives 2-4. However, additional foraging habitat would be created through clearing of forest for ski trails.

Activities in the Bridger Range that could affect foraging habitat include timber harvest, housing development, road construction, grazing, and prescribed burning. Impacts from these types of activities would be associated with conversion of native vegetation to less suitable foraging habitat, e.g., road surface, housing and lawn development, and conversion of riparian and mesic habitats to more xeric (dry) types through impacts to wetlands. Prescribed burning and conservative amounts of timber harvest could improve foraging habitat by improving vegetative establishment and increasing structural diversity in a manner that will favor production of insect prey.

### *Northern leopard frog (Rana pipiens)*

Past, current, and future projects listed earlier in this section could influence cumulative effects to the northern leopard frog. Projects such as livestock grazing in suitable habitat, agriculture and residential homes that use fertilizers and pesticides which degrade water quality, and stocking of predatory game fish at sites that currently lack them, are all considered to contribute to impacts to the northern leopard frog. In addition, developments that drain or alter breeding habitat permanently reduce the available habitat for this low mobility species.

### Brackett Creek Watershed

Under Alternative 1 activities associated with the existing ski area operations would have no additional cumulative effects on northern leopard frogs. Under alternatives 2 and 3 there would be approximately 0.48 acres of potential wetland impacts from vegetation clearing. These impacts would be limited to hand clearing of vegetation and significant effects to the structure and function of the wetlands are not expected to occur. Under Alternative 4, there would be no impacts to wetlands. The elevation of impacted wetlands (over 6500 feet) indicates that northern leopard frogs are unlikely to be present (Montana Fish, Wildlife and Parks website, 2004). Implementation of mitigation measures VM-3, VM-4, and VM6 is designed to minimize impacts to wetlands and would reduce potential impacts to individuals which may occur in the Study Area. For these reasons the Bridger Bowl Expansion is not expected to contribute further cumulative effects to the habitat of the northern leopard frog.

### Bridger Creek Watershed

No wetland impacts associated with the Bridger Bowl Expansion would occur in the Bridger Creek watershed. Under Alternative 1 activities associated with the existing ski

area operations would have no additional cumulative effects on northern leopard frogs. alternatives 2 and 4 propose a road in the southern expansion area which would cross a perennial stream. This stream provides potential breeding habitat for the northern leopard frog. Implementation of mitigation measure RP-1 is designed to minimize impacts to streams and would reduce potential impacts to individuals which may occur in the Study Area. In addition, this road would be closed during the off-season when northern leopard frogs are most likely to be active. Under Alternative 3, there would be no impacts to northern leopard frog breeding habitat within the Bridger Creek watershed.

#### *Boreal toad (*Bufo boreas boreas*)*

Past, current, and future projects listed earlier in this section could influence cumulative effects to the boreal toad. Projects such as livestock grazing in suitable habitat, agriculture and residential homes that use fertilizers and pesticides which degrade water quality, and stocking of predatory game fish at sites that currently lack them, are all considered to contribute to impacts to the boreal toad. In addition, developments that drain or alter breeding habitat permanently reduce the available habitat for this low mobility species.

#### Brackett Creek Watershed

Under Alternative 1 activities associated with the existing ski area operations would have no additional cumulative effects on boreal toads. Under alternatives 2 and 3 there would be approximately 0.48 acres of clearing impacts to potential wetland breeding sites within the northern expansion area. These impacts would be limited to hand clearing of vegetation and significant effects to the structure and function of the wetlands are not expected to occur. Implementation of mitigation measure W-5 in Table 2.6-1 would minimize construction related impacts to boreal toads that may be using the wetlands in the north expansion area for breeding by providing pre-construction surveys and implementing BMPs if needed. Under Alternative 4, there would be no impacts to boreal toad breeding habitat within the Brackett Creek watershed.

#### Bridger Creek Watershed

Under Alternative 1 activities associated with the existing ski area operations would have no additional cumulative effects on boreal toads. No impacts to wetlands are proposed under alternatives 2 and 4 in the Bridger Creek Watershed. However, alternatives 2 and 4 propose a road in the southern expansion area which would cross a perennial stream. This stream provides potential breeding habitat for boreal toad. Implementation of mitigation measure W-5 in Table 2.6-1 would minimize construction related impacts to boreal toads that may be using the stream in the south expansion area for breeding by providing pre-construction surveys and implementing BMPs if needed. In addition, this road would be closed during the off-season when boreal toads are most likely to be active. Under Alternative 3, there would be no impacts to boreal toad breeding habitat within the Bridger Creek watershed.

## Management Indicator Species

### *Pine marten (Martes americana)*

Cumulative effects to pine marten in the Bridger Range would be contributed to by activities such as housing development, road construction, timber harvest and prescribed burning. All of these activities could degrade pine marten habitat by removing important habitat components such as large trees and snags, and down woody debris. Urban development in the Bridger Range could have further detrimental cumulative effects to pine marten by producing attractants in the form of human food and/or garbage which could increase potential for conflicts resulting in direct mortalities for pine marten. . The Bracket Creek Land Exchange would aid in the creation of a more contiguous landscape in which these large ungulates could migrate, forage, and find security.

### *Migratory birds*

Cumulative effects to migratory birds would result from past, present and reasonably foreseeable future actions on federal, state and privately owned property, which have or would produce, further alteration of nesting habitat.

Past timber management, ski area development on private land, housing development and associated roading in the southeast Bridgers has produced some of the most highly fragmented forest habitat on the GNF. There is still a considerable proportion of private land in the Bridger Range on which some level of timber harvest can reasonably be expected to occur in the future. Currently, there are no timber harvests planned on federal lands in compartment 504 or 515 surrounding Bridger Bowl. Fragmentation effects associated with timber harvest for wood production are temporary. Although the effects may last for many generations of forest interior bird species, eventually, the forests are expected to grow back and provide nesting habitat. However, fragmentation effects associated with ski area and housing/commercial development produce a permanent encumbrance upon the landscape and the resultant loss of forest interior nesting habitat would be maintained in perpetuity.

### *Game birds and mammals*

Cumulative effects to game birds and mammals would result from past, present and reasonably foreseeable future actions on federal, state and privately owned property, which have or would produce further alteration of foraging and cover habitat.

Past timber management, housing development and associated roading in the southeast Bridgers has produced some of the most highly fragmented forest habitat on the GNF. There is still a considerable proportion of private land in the Bridger Range on which some level of timber harvest can reasonably be expected to occur in the future. There is currently no timber harvest planned on federal lands in compartment 504 or 515 surrounding the SUP area. Fragmentation effects associated with timber harvest for wood production are temporary. In some cases, timber harvests can increase foraging habitat for many big game species, while at the same time reducing cover and security habitat. Although the effects of timber harvest may last for many generations of game

birds and mammals, eventually, the forests are expected to grow back and provide cover habitat. However, fragmentation effects associated with ski area and housing/commercial development produce a permanent encumbrance upon the landscape and the resultant loss of forest interior nesting habitat would be maintained in perpetuity.

#### Blue grouse (*Dendragapus obscurus*)

Blue grouse commonly winter within the ski area, where they feed on conifer needles, and are frequently encountered by skiers. This species is more common at higher altitudes although it does occasionally descend to lower altitudes in the spring. Housing developments would permanently remove foraging and security habitat for this species. Timber harvests within the Bridger Range would remove forests that provide security and foraging, however, blue grouse are also known to feed at forest edges and openings during the spring.

#### Ruffed grouse (*Bonasa umbellus*)

Ruffed grouse are closely associated with aspen stands and rely heavily on aspen buds as a winter food source. This species is found at lower altitudes than the blue grouse and utilize deciduous thickets and riparian areas for foraging and cover. Housing developments would permanently remove foraging and cover habitat for this species. Timber harvests within the Bridger Range would remove forest cover but would most likely be located at higher elevations outside of the range of this species. Lower elevation timber harvest could result in the creation of foraging habitat as shrubs flourish in the recently harvested areas. Therefore, there would be no additional cumulative effects.

#### Elk (*Cervus elaphus*), Mule deer (*Odocoileus hemionus*), Moose (*Alces alces*)

Elk and mule deer are commonly observed within the Study Area during the summer and fall seasons but do not remain in the area during the winter. Moose are known to be year round residents. Additional developments within the Bridger Range for housing and recreation could affect populations by reducing cover and foraging habitat. As with elk and moose, mule deer utilize forested areas as cover and security habitat and forage in open shrub and herbaceous habitat; these habitat components would be permanently removed as a result of housing developments. The Bracket Creek Land Exchange would aid in the creation of a more contiguous landscape in which these large ungulates could migrate, forage, and find security.

#### White-tailed deer (*Odocoileus virginianus*)

White-tailed deer generally frequent lower elevations and are not expected to occur regularly within the Study Area. No cumulative impacts to white-tailed deer are expected to occur under any of the action alternatives.

### Mountain goat (*Oreamus americanus*)

Mountain goats have only been observed along the Bridger Ridge and are expected to be occasional residents to the Study Area. Cumulative impacts to mountain goat habitat are not expected to occur under any of the action alternatives.

### Black bear (*Ursus americanus*)

Black bears are known to occur within the Study Area. Proposed timber harvests within the Bridger Range would contribute to fragmentation of the landscape. Since black bears are considered habitat generalists they would still be able to utilize the open areas created by logging, however, fragmentation could lead to reduction in security habitat and travel habitat, which is typically in forested areas. Additional housing developments could lead to increased human-bear interactions and such interactions could result in human and/or bear injury and mortality. The Brackett Creek Land Exchange would lead to increased habitat continuity which could provide travel and security habitat for black bears.

### Mountain lion (*Felis concolor*)

Mountain lions most likely use the Study Area in association with the presence of ungulates; therefore effects to deer, elk, and moose would, to some degree, affect the distribution and presence of mountain lions within the Study Area. In addition, proposed timber harvests within the Bridger Range would contribute to fragmentation of the landscape, affecting travel and security habitat for mountain lions. As with black bear, additional housing developments could lead to increased human-mountain lion interactions and such interactions could result in human and/or mountain lion injury and mortality. The Brackett Creek Land Exchange would lead to increased habitat continuity which could provide travel and security habitat for mountain lions.

## **Other Species of Interest**

### *Boreal owl (*Aegolius funereus*)*

Cumulative effects to boreal owls in the Bridger Range would occur from loss of suitable habitat associated with the proposed expansion as well as past and future timber harvest, prescribed burns, future housing development including the Bridger Pines, and road construction, which will also contribute to the overall decline in boreal owl nesting habitat. Additional snow compaction beyond the existing Bridger Bowl boundaries may have the cumulative effect of further reducing prey availability for boreal owls in the Bridger Range. Motorized and non-motorized recreation has increased noticeably in the Bridger Mountains in the past decade. Snowmobiling is extremely popular and widespread in the Bridger Mountains, particularly on the east side where snow accumulation is greatest. Expansion of ski area into these areas would further reduce the availability of refuge areas for wildlife from motorized equipment.



#### 4.16.6 FISHERIES

Aquatic environments in forested ecosystems are known to be heavily influenced by the physical and biological process within the watershed as a whole (Barndt, 2003). Cumulative effects are spatial and/or temporal environmental effects to fish habitat resulting from the additive, repeated, and synergistic effects of other actions. The scale of the cumulative effects analysis for fisheries is the SF Brackett Creek Watershed and the Upper Bridger Creek Watershed. For the purpose of this analysis, the Upper Bridger Creek Watershed includes Upper Bridger Creek, Maynard Creek, and Slushman Creek. Cumulative effects on fisheries include the existing or baseline conditions described in Section 3.6 – Fisheries, those impacts associated with the Bridger Bowl SDEIS described in Section 4.6 – Fisheries, and other past, present, and reasonably foreseeable projects identified in the introduction to this cumulative effects section. These other projects include projects not associated with the Bridger Bowl SDEIS and have already, currently are, or are going to occur on lands within the Brackett Creek and Upper Bridger Creek Watersheds.

##### **South Fork Brackett Creek Watershed**

###### *Alternative 1*

With implementation of Alternative 1, there would be no impacts to fisheries, so the only additional cumulative effects would include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the SF Brackett Creek Watershed and are described in the introduction to this section. Past timber harvest by Bohart Ranch is considered a cumulative effects project that was incorporated into the sediment yield analysis used to determine the impacts of the alternatives. The Brackett Creek Grazing Allotment in another past and ongoing cumulative effects project, but it would not affect the results of the R1R4 sediment model because the model inputs are based primarily on land disturbance activities such as timber harvest, earth moving, and road building. No known reasonably foreseeable projects have been identified within the SF Brackett Creek Watershed that would affect the inputs in the R1R4 sediment model. Therefore, the analysis of cumulative effects on fisheries in the SF Brackett Creek Watershed is adequately addressed by the sediment model, which addresses the action alternatives and other past projects at the watershed scale.

The SF Brackett Creek sediment delivery rate is currently estimated at 8.2 percent over natural conditions with the existing road network. According to the 1999 MOU discussed in Chapter 3, the GNF sediment guideline for accelerated sediment delivery is 30 percent over natural conditions on an annual basis for the SF Brackett Watershed. The modeled sediment delivery rate for existing conditions is 8.2 percent over natural conditions for SF Brackett Creek, which is well below this level and would therefore meet the land-use strategy for Yellowstone cutthroat trout.

No populations of westslope cutthroat trout or Arctic grayling have been documented in the SF Brackett Creek Watershed and the historic ranges for these species do not include the SF Brackett Creek Watershed. Since there are no known populations of these species

present in the SF Brackett Creek Watershed, the identified past, present, and reasonable foreseeable projects would not result in cumulative impacts to these MIS and sensitive species.

#### *Alternatives 2 and 3*

The cumulative effects analysis for the Brackett Creek Watershed combines alternatives 2 and 3 because the potential sediment impacts to this watershed would be identical. The maximum sediment delivery due to construction activities proposed under alternatives 2 and 3 is estimated to increase delivery rates to 10.1 percent over natural conditions, which is a 1.8 percent increase over existing rates. The cumulative rate of sediment deposition in for the project implementation period is predicted to be approximately 1.3 percent with no routing being considered. In conclusion, this level of sediment delivery and deposition within SF Brackett Creek would have extremely limited, if any, negative effect on Yellowstone cutthroat trout habitat within the Brackett Creek Watershed. In addition, the modeled sediment delivery rate for alternatives 2 and 3 is 10.1 percent over natural conditions for SF Brackett Creek, which is well below 30 percent standard set in the 1999 MOU; as a result, it would meet the land-use strategy for Yellowstone cutthroat trout.

As stated above under Alternative 1, no ongoing or reasonably foreseeable cumulative effects projects would increase sediment delivery to the SF Brackett Creek Watershed. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the SF Brackett Creek Watershed, there would be no additional cumulative impacts to MIS and/or sensitive fisheries with implementation of alternatives 2 and 3.

No populations of westslope cutthroat trout or Artic grayling have been documented in the SF Brackett Creek Watershed and the historic ranges for these species do not include this watershed. Since there are no known populations of these species present in the SF Brackett Creek Watershed, alternatives 2 and 3 would not result in cumulative impacts to these species.

#### *Alternative 4*

There would be no sediment delivery impacts to the SF Brackett Creek Watershed as a result of project implementation under Alternative 4. Therefore, the only cumulative effects on MIS and/or sensitive fisheries under Alternative 4 include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the SF Brackett Creek Watershed. The cumulative effects of these projects are disclosed above in the analysis for Alternative 1.

## Upper Bridger Creek Watershed

### *Alternative 1*

With implementation of Alternative 1, there would be no impacts to fisheries, so the only cumulative effects would include the past, present, and reasonably foreseeable projects not related to the Bridger Bowl SDEIS that would occur within the Upper Bridger Creek Watershed and are described in the introduction to this section. All of the known cumulative effects projects that have occurred in the recent past were incorporated into the sediment yield analysis used to determine the impacts of the alternatives, including recently completed development in the Bridger Bowl base area, timber harvest by Bridger Bowl for trail development, past Bridger Pines development, and the Big Sky Lumber Harvest. The reasonably foreseeable projects identified within the Upper Bridger Creek Watershed are primarily small residential development projects in the Bridger Park subdivision and the remaining undeveloped home sites in the Bridger Pines subdivision. Future development of single family homes in these subdivisions would not likely result in measurable sediment yield impacts to the Upper Bridger Creek Watershed because of the small size, and staggered timeframe of the housing sites. In addition, these development projects will have to follow the provisions of the Montana Streamside Protection Act, included observation of the 50 foot-wide Stream Management Zones. Since the known reasonably foreseeable projects that have been identified within the Upper Bridger Creek Watershed are not likely to affect the R1R4 sediment model, the analysis of cumulative effects on fisheries in the Upper Bridger Creek Watershed is adequately addressed by the sediment model, which addresses the impacts of the action alternatives and other past projects at the watershed scale.

The three tributaries to the mainstem of Bridger Creek analyzed by the R1R4 sediment model do not have any documented fish presence and are all considered Class D streams by the GNF. According to GNF guidelines, to protect Class D streams, sediment increases should not exceed 100 percent above natural rates. According to estimates from the R1R4 model, the existing sediment yield to the three tributaries to the mainstem of Bridger Creek range from 27 to 77 percent above natural conditions. Therefore, the cumulative effects from all past Bridger Bowl and other projects within the Upper Bridger Creek Watershed have resulted in sediment yields that are within the GNF standard for Class D streams.

Suitable habitat for westslope cutthroat trout exists downstream of the Upper Bridger Creek Watershed. Since the sediment yield estimates are within the GNF standards, it is assumed that there are no current cumulative effects to this species. There are no current cumulative effects to Artic grayling because there is no suitable habitat in the three tributaries to Bridger Creek and no documented presence for this species in the entire Bridger Creek Watershed.

No populations of Yellowstone cutthroat trout have been documented in the Upper Bridger Creek Watershed and the historic range for this species does not include the Upper Bridger Creek Watershed. Since there are no known populations of this species

present in the Upper Bridger Creek Watershed, the identified past, present, and reasonable foreseeable projects would not result in cumulative impacts to this species.

### *Alternative 2*

Under Alternative 2, there would be 57 acres of temporary soil impacts, seven acres of permanent soil impacts, and one new road stream crossing, which may be a potential source of sediments to streams within the Study Area. Induced sedimentation from the existing and proposed developments and disturbances in the Upper Bridger Creek Watershed was evaluated using the R1R4 model (Cline et al., 1981). The maximum sediment delivery due to construction activities proposed under Alternative 2 is estimated to increase delivery rates in the three tributaries to the mainstem of Bridger Creek by 1.5 to 3.5 tons per year, increasing rates over natural conditions to 28.4 to 83.9 percent. Increases in sediment yield as a result of activities proposed under Alternative 2 would not exceed the 100 percent above natural rates guidelines of the GNF. Therefore, this level of sediment delivery and deposition within Upper Bridger Creek Watershed would have extremely limited, if any, negative effect on westslope cutthroat trout habitat within the Upper Bridger Creek Watershed. Alternative 2 would not have any cumulative effects from known projects on Yellowstone cutthroat trout or Arctic grayling because there is no suitable habitat in the three tributaries to Bridger Creek and no documented presence for these species in the entire Bridger Creek Watershed.

As stated above under Alternative 1, the known reasonably foreseeable cumulative effects projects in the Upper Bridger Creek Watershed would not likely to affect the R1R4 sediment model. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to fisheries from implementation of Alternative 2 other than the impacts previously disclosed for Alternative 2.

### *Alternative 3*

Cumulative impacts on fisheries in the Upper Bridger Creek Watershed from sediment yield from Alternative 3 would be less than Alternative 2 because there would be no development in the Slushman Drainage. Under Alternative 3, there would be no additional sediment impacts to Slushman Creek over existing conditions. Sediment impacts to Upper Bridger Creek and Maynard Creek would be the same under Alternative 3 as in Alternative 2. Since increases in sediment yield from Alternative 3 would not exceed GNF guidelines, there would be extremely limited, if any, negative effects on westslope cutthroat trout habitat within the Upper Bridger Creek Watershed. In addition, Alternative 3 would not have any cumulative effects from known projects on Yellowstone cutthroat trout or Arctic grayling because there is no suitable habitat in the three tributaries to Bridger Creek and no documented presence for these species in the entire Bridger Creek Watershed.

As stated above under Alternative 1, the known reasonably foreseeable cumulative effects projects in the Upper Bridger Creek Watershed would not likely to affect the R1R4 sediment model. Based on the analysis of impacts from all known past, present,

and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to fisheries from implementation of Alternative 3 other than the impacts previously disclosed for Alternative 3.

#### *Alternative 4*

Under Alternative 4, the development activities proposed in the Bradley Meadows area would not occur. As a result of the reduction of road and trail building in Upper Bridger Creek and Maynard Creek, the estimated sediment yield to these streams would be less under Alternative 4 than under Alternative 2. Sediment yield impacts to Slushman Creek would be the same under Alternative 4 as Alternative 2 because the S-1 and P-2 lifts would be constructed. Since increases in sediment yield from Alternative 4 would not exceed GNF guidelines, there would be extremely limited, if any, negative effects on westslope cutthroat trout habitat within the Upper Bridger Creek Watershed. In addition, Alternative 4 would not have any cumulative effects from known projects on Yellowstone cutthroat trout or Arctic grayling because there is no suitable habitat in the three tributaries to Bridger Creek and no documented presence for these species in the entire Bridger Creek Watershed.

As stated above under Alternative 1, the known reasonably foreseeable cumulative effects projects in the Upper Bridger Creek Watershed would not likely to affect the R1R4 sediment model. Based on the analysis of impacts from all known past, present, and reasonably foreseeable projects in the Upper Bridger Creek Watershed, there would be no cumulative impacts to fisheries from implementation of Alternative 4 other than the impacts previously disclosed for Alternative 4.

#### 4.16.7 ROADLESS

Timber harvests, ski area development, and residential development on private lands have all affected the appearance and character of the roadless area adjacent to the Bridger Bowl SUP as a result of human presence and manipulation of the environment. The physical proximity to this development has decreased opportunities for feelings of remoteness and solitude within the IRA. Continued operations of the ski area and proposed project elements would continue to affect the wilderness quality of this area.

#### 4.16.8 AIR QUALITY

The air quality analysis for Alternative 2 includes a cumulative effects evaluation of existing air quality in the Bridger Bowl area considering local sources (construction equipment, vehicles, road dust, residential wood burning, and smoke from logging slash disposal), motor vehicle emissions, and stationary sources within 60 miles. Air quality within the Bridger Range and Bridger Bowl is excellent with very limited local sources and consistently robust wind dispersion (Elliott et al., 1986). Increased development of the Bridger Bowl base area and surrounding private lands could pose additional air quality impacts as a result of construction and additional vehicular traffic; however, the majority of this development would likely serve to reduce traffic along BCR as it would

be designed to accommodate guests in closer proximity to the ski area, thereby decreasing the need to travel between the resort and Bozeman.

#### 4.16.9 CULTURAL RESOURCES

No cultural resources were identified within the Study Area; therefore, no past or ongoing activities have been known to affect these resources. As a result, none of the reasonably foreseeable future actions identified for this proposal are anticipated to affect cultural resources.

#### 4.16.10 RECREATION

An anticipated increase in skier visitation at Bridger Bowl as a result of this proposal combined with improvements at competing Montana ski areas would cumulatively stimulate skier visitation in the region. Approval of any of the action alternatives would likely encourage the development of lodging and other recreation amenities on private land in the immediate vicinity of Bridger Bowl. To a certain degree, the rate of this private development may also dictate the rate of full implementation of any action alternative. The cumulative effect of ski area and base area development may result in the overall growth of skier visitation in the state of Montana. This would represent the continuation of a long-term trend, which is demonstrated by Montana's growing importance in the alpine skiing marketplace.

The demand for hiking, horseback riding, mountain biking, and other summer recreation opportunities within the SUP would also be expected to increase as a result of local and regional population growth and off-site developments that attract new visitors to Bridger Bowl and the Bozeman area. The proposed travel management plan, which is currently being prepared by the GNF, may change recreation use patterns in the surrounding area. If approved and implemented, the portion addressing SF Brackett Creek would change access routes. Over the long term, other off-site public and private recreation developments could serve to disperse recreational use patterns on the GNF.

#### 4.16.11 VISUAL RESOURCES

Past actions that have affected the visual quality of the area as viewed from Bridger Canyon Road (BCR) include timber harvests, ski area development, and residential development adjacent to Bridger Bowl. The existing ski area is a generally accepted characteristic of this area. Ongoing residential development, ski area operations, and agriculture on private and public land in the vicinity would likely result in incremental impacts to visual quality along BCR over the long term. The proposed expansion of the Bridger Bowl SUP into Bradley Meadows would increase the number and size of the openings in an area that is visually sensitive to passersby on BCR. However, under a Forest Plan amendment, the land designation would change from MA 12 to MA 2. Direction for MA 2 is to meet a VQO of *Partial Retention*, and each of the action alternatives would be consistent with this direction.



#### 4.16.12 SOCIO-ECONOMIC RESOURCES

As cited by civic and business groups in the community in their promotional literature, Bridger Bowl contributes to the overall quality of life in the Bozeman and Gallatin Valley areas. It is a recreational outlet that serves as a complement to the business, cultural, and educational opportunities in the area. Patronage by local residents and its ranking as one of the largest employers in Gallatin County indicate its importance to the community.

The proposed improvements would be expected to improve the ski area's viability and potentially additional private commercial activity and employment opportunities in the tourism industry. Improvements at the ski area could generate conversion of surrounding rural private lands to commercial or residential use, impacting the corresponding property tax bases. Additional taxable business property, such as chairlifts at the resort, would result in additional fees being paid to both the state and the county in the form of taxes.

Full build-out of any of the action alternatives would depend largely upon increased residential and commercial development of private lands near the base of the ski area. Projected population increases and demand for residential and vacation housing on lands at and near the ski area are expected to drive the need for expansion of the ski area facilities, rather than ski area expansion creating the demand for housing. Development in Bridger Canyon would continue to be governed by the Bridger Canyon Zoning Ordinance, which strictly limits the amount of development on the private lands in the immediate vicinity of Bridger Bowl.

#### 4.16.13 TRANSPORTATION

Past activities that have affected traffic along BCR include ski area development and dispersed recreation along the canyon. The proposed project elements are anticipated to result in an increase in skier visitation and, as a result, an increase in traffic along BCR. Further development of the Bridger Bowl base area and surrounding private lands could pose additional traffic congestion. However, there is limited potential for development as a result of zoning restrictions. The majority of development that could occur would likely serve to reduce traffic along BCR and the Bridger Bowl access road as well as the demand for parking as it would be designed to accommodate guests in closer proximity to the ski area, thereby decreasing the need to travel between the resort and Bozeman.

#### 4.16.14 INFRASTRUCTURE AND UTILITIES

The majority of the infrastructure and utilities at the ski area are specific to Bridger Bowl, including domestic water from wells, on-site wastewater treatment, fuel storage, and mountain access roads. Since the MDP has a lifetime of 40 years, no other reasonably foreseeable future actions are anticipated at the ski area that would affect these resources. Electric power is relative to all of Bridger Canyon. Power demand is not expected to change appreciably in the canyon due to the limited development potential as governed by zoning restrictions. There would likely only be small increases in power demand as a result of individual residences being built along the canyon.

#### 4.16.15 NOISE

Cumulative effects for noise as a result of the proposal include an evaluation of existing noise in the Bridger Bowl area in conjunction with local noise sources nearby such as residential developments in the base area and BCR. Noise within Bridger Canyon is not expected to change appreciably over time because of the limited development potential of the surrounding area due to zoning restrictions. Since there are no known State of Montana or Gallatin County noise ordinances, Bridger Bowl would not violate any codes with implementation of any of the action alternatives.

#### **4.17 RELATIONSHIP BETWEEN SHORT-TERM USE AND LONG-TERM PRODUCTIVITY**

In this section, short-term effects (beneficial and adverse) of the alternatives are discussed in terms of their implications for the long-term stability and productivity of the environment at Bridger Bow.

Bridger Bowl has been committed to long-term management since the SUP was issued in 1956. This use accommodates a high level of recreation visits on a relatively small portion of the GNF. In a statement related to the operation of ski areas, Jack Ward Thomas, Chief of the U.S. Forest Service, noted that "[t]here is probably nowhere on National Forest land that we provide so much use on such a small area with such low impact" (Seattle Times 8/7/94, p. B4). The alternatives continue this long-term commitment of the local environment to a relatively high-density recreational use. Continued development creates an opportunity for a considerably greater number of people to utilize the area.

There would be a potential for direct, indirect, and cumulative effects on soil from vegetation clearing, parking lot construction, and other earthwork. Losses of long-term productivity would be expected to be palliated by proposed mitigation measures, particularly those calling for the minimization of vegetation removal, protection of streams, and revegetation of disturbed areas. Effects would vary by alternative with the amount of management activities.

In the long-term, emissions into the atmosphere would be augmented by increased vehicular use, as well as construction and operation activities. Soil productivity would be lost where facilities are developed. The loss of wildlife habitat would continue as long as Bridger Bowl facilities are in place. Hydrologic effects would generally be short-term, related to the period between construction and completion of revegetation. The removal of vegetation, particularly trees and shrubs, would change the composition of vegetation communities. The placement of additional ski lifts and trails, parking lots and other facilities would change the area's visual character.

The noise levels within and adjacent to the permit area would be raised. The amount of land dedicated to alpine skiing would be increased with the ski terrain and lifts proposed. The population, both seasonal and permanent, within the Bridger Bowl community would increase. Additional commercial and retail development would serve the increase in visitors. Changes to the character of the local community would occur. A broader tax base, resulting from expansion of Bridger Bowl and the indirect income provided by tourists, would be partially offset by increased demand for services. In the long-term, permit fees and taxes paid to the federal government and to Gallatin County would be expected to cover most additional costs. Highway maintenance and improvement costs would increase. Highway improvements and/or traffic mitigation would be necessary to accommodate the increased traffic congestion at peak times. The consumption of electrical power and fuels would increase. Additional water consumption would be necessary to meet development demands for both domestic and snowmaking purposes.

#### **4.18                    IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irreversible commitment of resources refers to non-renewable resources, such as cultural resources, or to those factors which are renewable only over long time spans, such as soil productivity. Irretrievable commitment applies to losses of production, harvest, or use of renewable natural resources. For example, the timber production capability of the area is irretrievably lost while the area is used as a winter recreation site. The production lost is irretrievable, but the action is not irreversible.

Ski resort development would represent an essentially permanent commitment of the area to a relatively high intensity recreational use. Additional development would not be a completely irreversible or irretrievable commitment of resources, although from a practical standpoint, it can be considered as such. Should the time come that development of Bridger Bowl within the permit area would no longer be desired or be viable and is amortized, the various facilities could be dismantled and removed, and the area revegetated or allowed to return to a natural state, although resource values could never be returned to their pre-development conditions.

Irreversible commitments would include construction of the new parking areas (which would be built on private lands) because of the earthwork required and the chemical action of petroleum-based surfacing, if paved. Other aspects of development, including lifts, utilities and buildings can be reversed and natural resources restored over time.

Loss of soil productivity would be irreversible at the sites of development. Compaction along trails and other places frequented by people could cause irretrievable impacts to the ability of these areas to support vegetation. Vegetation removed for facility development would be an irretrievable impact for at least the life of the facility. In highly developed areas, reclamation can be slow and costly. Timber harvest in the expansion area would be replaceable only in the very long term. If revegetation is not successful after disturbance for facility development, erosion could become a continuing problem, accompanied by concomitant loss of fertility and further reduction in revegetation potential.

Some loss of wildlife habitat would also be irretrievable for the life of Bridger Bowl. Increased human disturbance could cause some species to permanently avoid the area, thus indirectly impacting the carrying capacity of other areas on the mountain. The loss of some species using the area could be irreversible until such time as habitat is restored.

The visual resource would be irretrievably altered by the addition of lifts, ski trails and buildings for the life of these facilities.

Continued operation of Bridger Bowl as well as increased visitor use of the area represents increased potential for disturbance to historic and/or prehistoric resources in the project area.

#### **4.19 SPECIFICALLY REQUIRED DISCLOSURES**

##### **EFFECTS OF ALTERNATIVES ON THREATENED AND ENDANGERED SPECIES AND/OR CRITICAL HABITAT**

There would be no effect to gray wolf, bald eagle, and grizzly bear as a result of this proposal. Alternatives 2 and 3 would result in a determination of likely to adversely affect Canada lynx habitat, and Alternative 4 may affect but is not likely to adversely affect Canada lynx.

##### **EFFECTS OF ALTERNATIVES ON PRIME FARM LAND, RANGELAND, AND FOREST LAND**

All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1827 for prime land. The project area does not contain any prime farmlands or rangelands. "Prime" forestland does not apply to lands within the National Forest system. In all alternatives, National Forest System Lands (NFSL) would be managed with sensitivity to the effects on adjacent lands.

##### **ENERGY REQUIREMENTS OF ALTERNATIVES**

There are no unusual energy requirements for implementing any of the alternatives.

##### **EFFECTS OF ALTERNATIVES ON CIVIL RIGHTS AND EQUAL OPPORTUNITY (E.O. 12898)**

The alternatives are not expected to affect civil rights to any degree, nor would the design, construction, or operation of the resort involve discrimination against any minority group or women. None of the alternatives would have this disproportionate adverse health or environmental impacts to minority, groups, women, or low-income populations. All alternatives comply with Title VI of the Civil Rights Act and E.O. 12898.

Expansion of Bridger Bowl, if approved, would operate under the direct permitting authority of the USDA Forest Service, GNF. The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD). To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, D.C. 20250, or call (202) 720-7327 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

## EFFECTS ON WETLANDS AND FLOODPLAINS

There would be no significant effects on wetlands resulting from any of the alternatives.

## COMPLIANCE WITH SECTION 504 OF THE VOCATION REHABILITATION ACT AND THE AMERICANS WITH DISABILITIES ACT (ADA)

The permittee would be required to comply with all applicable provisions of Section 504 and the ADA. Compliance would be monitored through review of all construction plans and annual Operating Plans. Any new special use permit authorized would also include Section 504 and ADA compliance and monitoring provisions.





# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 5

### List of Preparers



Gallatin National Forest  
Bozeman Ranger District

## **5.0 LIST OF PREPARERS**

This SDEIS was prepared by a team of Forest Service ID Team and a third-party contractor selected by the Forest Service through a Memorandum of Understanding between the GNF and Bridger Bowl. In accordance with CEQ regulations [1506.5(c)], the consultant, SE Group, was selected solely by the Forest Service. The consultant and all subconsultants executed disclosure statements specifying that they have no financial or other interest in the outcome of the project. The Forest Service provided guidance throughout the preparation of the DEIS and has sole responsibility for its scope and content.

### **5.1 FOREST SERVICE INTERDISCIPLINARY TEAM AND PARTICIPANTS**

The following people participated in initial scoping, were members of the Interdisciplinary Team, and/or provided direction and assistance during the preparation of the DEIS.

Walt Allen	Forest Archaeologist; Supervisor's Office; Gallatin National Forest
Scott Barndt	Fisheries Biologist, Bozeman Ranger District, Gallatin National Forest
Dave Cary	Recreational Planner; Bozeman Ranger District; Gallatin National Forest
Marion Cherry	Wildlife Biologist; Supervisor's Office; Gallatin National Forest
Steve Christiansen	NEPA coordinator; Supervisor's Office; Gallatin National Forest
Bev Dixon	Wildlife Biologist; Bozeman Ranger District; Gallatin National Forest
Nancy Halstrom	Resource Assistant and IDT Leader; Bozeman Ranger District; Gallatin National Forest
Jonathan Kempff	Forest Engineer, Supervisor's Office, Gallatin National Forest
Wally McClure	Fisheries Biologist; Supervisor's Office; Gallatin National Forest
Jane Ruchman	Landscape Architect; Supervisor's Office; Gallatin National Forest
Henry Shovic	Soil Scientist; Supervisor's Office; Gallatin National Forest
Mark Story	Forest Hydrologist; Supervisor's Office; Gallatin National Forest
Steve Swain	Geographic Information Systems Analyst, Bozeman Ranger District, Gallatin National Forest

## 5.2 CONSULTANT TEAM

### **SE Group**

Bruce Erickson	Project Manager and Mountain Planner
Bill Granger	Senior Ecologist, Practice Group Leader
Greg Hughes	GIS Analyst
Emily Larson	Environmental Analyst and Production Specialist
Cathy Robinson	Wildlife Biologist
Paula Samuelson	Production Specialist
Lisa Sakata	Environmental Analyst
Travis Spikes	Project Manager, Ecologist
Alex White	Environmental Analyst
Zach Perdue	GIS Technician

### **Sub-Contractors**

Monica Brelsford	Wildlife and Vegetation Specialist
James Jacobs	Vegetation Specialist
Bruce Maxwell	Vegetation Specialist

### **Robert Peccia and Associates, Inc.**

Douglas E. Windmayer, P.E.	Transportation Analyst
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# **BRIDGER BOWL SUPPLEMENTAL DEIS**

## **Chapter 6**

### **Agencies and Governments Consulted**



**Gallatin National Forest  
Bozeman Ranger District**

## **6.0 AGENCIES CONTACTED**

### **Federal Government**

US Army Corps of Engineers  
US Environmental Protection Agency  
US Fish and Wildlife Service

### **State Government**

Montana Department of Fish and Game  
Montana Department of State Lands

### **Local Government**

City of Bozeman  
Gallatin County

### **Local Media**

Belgrade News  
Bozeman Daily Chronicle  
High Country Independent Press  
Livingston Enterprise  
Lone Peak Lookout

KATH	KBOZ	KCTZ	KMMS
KSKY	KTVM	KUSM	KXLB

### **Other Agencies, Businesses, and Organizations**

Confederated Salish and Kootenai Tribes  
Crow Tribal Council  
Montana State University





# BRIDGER BOWL SUPPLEMENTAL DEIS

## Chapter 7 References



Gallatin National Forest  
Bozeman Ranger District



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# BRIDGER BOWL SUPPLEMENTAL DEIS

Chapter 8

Glossary



Gallatin National Forest  
Bozeman Ranger District

## 8.0 GLOSSARY

**affected environment:** The physical, biological, social, and economic environment within which human activity is proposed.

**airshed:** The air in a specific geographic region, in which air quality is managed.

**allocation:** The assignment of sets of management practices to particular land areas to achieve the goals and objectives of the alternative.

**artifact:** A simple object (such as a tool or ornament) showing early human workmanship or modifications.

**background:** The view beginning three to five miles from the observer and as far into the distance as the eye can detect the presence of objects. Also, in economics, naturally occurring; uninduced.

**bedload:** Suspended particles of sand, gravel, or soil carried by flowing water.

**canopy:** The more-or-less continuous cover of leaves and branches collectively formed by the crowns of adjacent trees in a stand or forest.

**Comfortable Carrying Capacity (CCC):** The Comfortable Carrying Capacity of a mountain resort is the number of skiers an entire resort can comfortably accommodate at any given time and still guarantee a pleasant recreation experience. A resort's CCC does not reflect the number of skiers on the mountain at one time. Generally, 70 to 85 percent of a mountain's total CCC would be active skiers, including those on the trails, riding lifts, and waiting in lift lines. The remaining 15 to 30 percent would be using guest service facilities or milling in areas near these facilities. Sometimes referred to as skiers-at-one-time (SAOT).

**coniferous:** Forest consisting entirely of or mostly of cone-bearing, usually evergreen and needle-leaved trees.

**corridor:** A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

**Council on Environmental Quality (CEQ):** An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

**cover:** Vegetation used by wildlife for protection from predators and weather conditions, or in which to reproduce.

**cubic foot per second (cfs):** Unit measure of streamflow or discharge, equivalent to 449 gallons per minute or about 2 acre-feet per day.

**cumulative effects:** The combined effects of all direct and indirect impacts with detrimental and beneficial effects identified within and adjacent to the SUP area.

**cumulative impact:** An effect that is the result of several related projects, past, present, and/or reasonable foreseeable future. Each increment from each project may not be noticeable but cumulative impacts may be noticeable when all increments are considered together.

**demand:** The quantity of goods or services called for, given a price or other combinations of factors.

**developed recreation site:** Distinctly defined area where facilities are provided for concentrated public use (e.g., ski areas, campgrounds, picnic areas, boating sites, and interpretive facilities).

**direct impact:** An effect that occurs as a result of an action to implement a proposal or alternative.

**dispersed recreation:** Outdoor recreation that occurs outside of planned and maintained recreational facilities (e.g., scenic driving, hunting, backpacking).

**diversity:** The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

**ecology:** The study of plants and animals in relation to their environment.

**ecosystem:** The system formed by the interaction of a group of organisms and their environment.

**effects:** Results expected to be achieved from implementation of the alternatives relative to physical, biological, economic, and social factors. There are direct effects, indirect effects, and cumulative effects.

**endangered species:** Any species listed as such in the Federal Register, which is in danger of extinction throughout all or a significant portion of its range.

**environmental analysis:** An analysis of alternative actions and their predictable short and long-term environmental effects, which include physical, biological, economic, social and environmental design factors and their interaction.

**environmental assessment (EA):** A concise public document required by the regulations implementing the National Environmental Policy Act, that briefly provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

**environmental impact statement (EIS):** A statement of the environmental effects that would be expected to result from proposed alternative management actions.

**erosion:** The detachment and movement of soil from the land surface by wind, water, or gravity.

**erosion control:** Materials and structures utilized to reduce erosion.

**fisheries:** Streams, lakes, and reservoirs that support fish utilized by anglers.

**forage:** All browse and nonwoody plants used for grazing or harvested for feeding livestock or game animals.

**foreground:** The portions of a view between the observer and up to ¼ or ½ mile distant.

**Forest Plan:** The Gallatin National Forest Land and Resource Management Plan, which was published September 1987.

**Forest Supervisor:** The official responsible for administering the National Forest System lands in a Forest Service administrative unit who reports to the Regional Forester.

**fragmentation:** The process of reducing size and connectivity of stands that compose a forest.

**game species:** Any species of wildlife or fish for which seasons and bag limits have been prescribed and which are normally harvested by hunters, trappers, and fisherman under State or Federal laws, codes, and regulations.

**glading:** The removal of trees in a more dense overstory on a site, generally to enhance tree skiing opportunities.

**goods and services:** The outputs produced by Forest resources, the tangible and intangible values of which are expressed in market and non-market terms.

**gradient:** The vertical distance water falls while traveling a horizontal distance downstream.

**grazing:** Consumption of herbage or artificial pasture forage by animals.

**Gross Fixed Assets:** The total of the original undepreciated cost (note present value) of improvements and fixtures, plus the cost of equipment necessary to generate sales and other income (day buildings, lifts, equipment, investment in trails, parking, etc.) minus the cost of equipment which has been disposed of. Gross Fixed Assets are shown at original cost, including additions, i.e., prior to any allowances for depreciation and/or amortization.

**groundwater:** Subsurface water in the part of the ground that is wholly saturated.

**guideline:** An indication or outline of policy or conduct that is not a mandatory requirement (as opposed to a standard, which is mandatory).

**habitat:** The sum of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

**herbaceous:** Plants whose growing stems possess little or no woody tissue.

**heritage resource:** Heritage resources are the tangible and intangible aspects of cultural systems, living and dead, that are valued by a given culture or contain information about the culture. Cultural resources include, but are not limited to, sites, structures, buildings, districts, and objects associated with or representative of people, cultures, and human activities and events.

**historic:** dating from or preserved from a past time or culture.

**hydric:** pertaining to wetlands.

**hydrophyte:** wetland plants

**Impact:** Any change in physical, biological, social or economic factors, which directly or indirectly results from implementation of an action. Impacts may be direct or indirect, and long-term or short-term depending upon the type of change and the resource area being discussed.

**indirect impact:** An effect that occurs when the environment adjusts to a direct impact.

**insignificant impacts:** Changes in the environment resulting from the implementation of an alternative which are considered insignificant.

**interdisciplinary team (IDT):** A group of individuals with different training that solves a problem or performs a task through frequent interaction so that disciplines can combine to provide new solutions.

**Inventoried Roadless Areas (IRAs):** Areas of National Forest System land currently inventoried for planning purposes as roadless areas. This inventory is based on individual forest plans, forest plan revisions in progress where the USFS has established an inventory, or other assessments that are completed and adopted by the USFS.

**irretrievable commitments:** Allocation decisions causing loss of production or use of a renewable resource.

**irreversible commitments:** Allocation decisions affecting nonrenewable resources causing permanent loss of those resources.

**long-term effects:** Action governed by the Forest Plan, generally taking place over a period longer than ten years from the present.

**management concern:** An issue, problem, or condition that constrains the range of management practices identified by the Forest Service in the planning process.

**management direction:** A statement of multiple-use and other goals and objectives, the associated management prescriptions, and standards and guidelines for attaining them.

**management indicator species (MIS):** A particular type of plant or animal whose presence in a certain situation or location is a fairly certain sign or symptom that particular environmental conditions are also present.

**management practice:** A specific activity, measure, course of action, or treatment.

**management prescription:** Management practices and intensity selected and scheduled for applications on a specific area to attain multiple-use benefits and other goals and objectives.

**maximum modification:** See visual quality objectives.

**middleground (middle distance):** The space between the foreground and the background in a picture or landscape. The area located from ¼ - ½ to 3 - 5 miles from the viewer.

**mitigation:** Actions to avoid, minimize, reduce, eliminate, or rectify the adverse impacts of a management practice.

**modification:** See visual quality objectives

**National Environmental Policy Act (NEPA):** A 1970 Act of Congress that is our basic national charter for protection of the environment.

**National Forest Management Act (NFMA):** A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of regulations to guide that development.

**National Forest System (NFS) land:** National Forests, National Grasslands, and other related lands for which the Forest Service is assigned administrative responsibility.

**National Recreation Trail:** A trail designated as part of the National system of trails authorized by the National Trails System Act. National Recreation Trails provide a variety of outdoor recreation uses in or reasonably accessible to urban areas.

**National Register of Historic Places:** A listing maintained by the U.S. National Park Service of areas that have been designated as historically significant. The register includes places of local and State significance, as well as those of value to the Nation in general.

**no action alternative:** The alternative that continues current management direction.

**objective:** A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

**off-piste impact:** Downhill terrain not associated with a specific, maintained ski trail.

**off-site impact:** An impact that affects the environment outside the boundaries of the project area.

**on-site impact:** An impact that affects the environment within the boundaries of the project area.

**old growth:** A stand that is past full maturity and showing signs of decadence; the last stage in forest succession. The characteristics will vary by tree age, size, height, or density timber type. Region 1 guidelines for eastern Montana and within this analysis area include: lodgepole pine type characterized with at least 12 trees per acre that are over 10" dbh or larger (diameter-at-breast-height) and 150 years or older. Douglas fir stands are characterized with at least 5 trees per acre that are 19" dbh or larger (diameter-at-breast-height) and 200 years or older. Subalpine fir stands are characterized with 10 or more trees per acre over 13" dbh and over 160 years old (Green, et al).

**partial retention:** See visual quality objectives.

**particulates:** Small particles suspended in the air and generally considered pollutants.

**permanent impact:** An impact that continues for an extended period of time or lasts throughout the life of the MDP.

**permit area:** The area of NFS lands encompassed in the SUP issued to Bridger Bowl by the GNF.

**practicable:** Achievable after taking into consideration cost, existing technology, and logistics in light of overall project purposes

**preferred alternative:** The alternative identified by the Forest Supervisor which may be selected as the final alternative in a Record of Decision.

**prehistoric:** of, relating to, or existing in times antedating written history.

**preservation:** See visual quality objectives.

**project area:** The area encompassed by the development proposal, including, but not limited to the Bridger Bowl Ski Area SUP.



**proponent:** The individual or business who is proposing to accomplish a project. In this case, the proponent is Bridger Bowl Ski Area.

**Proposed Action:** A NEPA term that is used to describe the proposed project or activity that is under environmental analysis.

**public issue:** A subject or question of widespread public interest relating to management of the National Forest System.

**riparian area:** Land situated along the bank of a stream or other body of water and directly influenced by the presence of water (e.g., streamsides, lake shores, etc.).

**scoping process:** The process used to identify issues and concerns that are within Forest Service authority to resolve.

**sedimentation:** The deposition of soil particles and rock fragments by water. Sedimentation usually occurs in the slow moving sections of streams, like pools and glides, or when a stream enters a lake.

**sensitive species:** Species that have appeared in the Federal Register as proposed additions to the endangered or threatened species list; those species that are on an official State list or are recognized by the Regional Forester to need special management in order to prevent them from becoming endangered or threatened.

**significant impact:** A judgment based on the context and intensity of the impact; generally, a significant impact is one that exceeds a standard, guideline, law, or regulation.

**skier visit:** Skier visitor day. One visitor day equals one lift ticket sold.

**snowmaking:** A process where water is sprayed into the air in subfreezing temperatures to form fine particles of snow. These particles fall to the ground to form a condensed granular snowpack that provides an excellent and durable surface for skiing.

**soil:** A dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms.

**Special Use Permit (SUP):** A permit authorizing the occupancy and use of National Forest System land in the manner specified.

**stand:** A community of trees or other vegetation that is sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities, and to thus form a management entity.

**sublimation:** The process by which solids are transformed directly to the vapor state or vice versa without passing through the liquid phase.

**subnivean:** The space that forms between the ground and the underside of the snowpack. The structure of the habitat plays an important role in facilitating the development of the space. Small mammals are known to use this space for travel and security during the winter season.

**surficial:** Pertaining to the surface.

**sustained yield:** The achievement and maintenance in perpetuity regular periodic output of the various renewable resources of the National Forest System without impairment of the productivity of the land.

**talus:** A loose collection of rock fragments that accumulates at the base of a cliff or steep rocky slope.

**temporary impact:** An impact that occurs during construction and/or for 1 – 2 growing seasons thereafter; or an impact that may occur after brief activities associated with operation and maintenance.

**threatened species:** Any species that is likely to become an endangered species within the foreseeable future and which has been designated in the Federal Register as a threatened species.

**transpiration:** The process by which plants take in water at the root tips for growth and other life-support needs, and release it as a vapor at the leaf surface, mostly during the warmest months of the year

**understory:** Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory.

**vascular plants:** Plants that possess a vascular system for conducting substances from one part of plant (such as roots) to another (such as leaves); includes the flowering plants, conifers, ferns, and fern allies.

**vegetation:** The plants of an area or region; plant life collectively.

**viewshed:** The landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

**visual quality objectives (VQOs):** A set of measurable maximum levels of future alteration of a characteristic landscape. These levels are as follows:

- **Preservation (P)** – Allows ecological change only. Management activities are prohibited except for very low visually impacting recreation facilities.
- **Retention (R)** – Management activities may not be visually evident. Contrast in form, line, color, and texture must be reduced during or immediately after the management activity.
- **Partial Retention (PR)** – Management activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color, and texture must be reduced as soon after project completion as possible but within the first year.
- **Modification (M)** – Management activities may visually dominate the characteristic landscape. However, landform and vegetative alterations must borrow from naturally established form, line, color, or texture so as to blend with the surrounding landscape character. The objective should be met within one year of project completion.
- **Maximum Modification (MM)** – Management activities including vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background they must visually appear as natural occurrences within the surrounding landscapes or character type. Reduction of contrast should be accomplished within five years.

**visual resource:** The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

**water rights:** The legal right to use water.

**watershed:** The entire area that contributes water to a drainage system or stream.

**water yield:** The total amount of water coming from an area of land, commonly a watershed, over a given period of time.

**wetlands:** An area at least periodically wet or flooded, where water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (e.g., bogs and marshes).

**wildlife:** Animals living in a natural, undomesticated state.



# BRIDGER BOWL SUPPLEMENTAL DEIS

Chapter 9

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Gallatin National Forest  
Bozeman Ranger District

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# BRIDGER BOWL SUPPLEMENTAL DEIS

## Appendices



Gallatin National Forest  
Bozeman Ranger District

## APPENDIX A – COMMENTS RECEIVED AND ISSUES RAISED DURING THE SCOPING PROCESS

Resource/Issue (number of comments received)	Description of Comment
<b>Air Quality</b> (1)	Construction and operation of the project may affect air quality on-site and in the surrounding area.
<b>Cumulative Effects</b> (4)	What effects would this project have in combination with other proposals, including growth and development in the Bridger Canyon area?
<b>Socio-Economics</b> (1)	Concern was raised regarding the future cost of a ski pass.
<b>Purpose and Need</b> (2)	Concern was expressed over the necessity of this project.
<b>Compliance with other Regulations</b> (1)	This project must be reviewed by Gallatin County.
<b>Recreation and User Conflicts</b> (36)	
<i>Loss of Backcountry Skiing Opportunities</i>	Backcountry skiing opportunities may be lost if the ski area boundaries are expanded
	Lift-served skiing in the Pine-Slushman area would reduce available backcountry skiing
<i>Lift-served Ridge Access</i>	Access to the ridge via lifts may reduce skiing quality and the quality of the experience. Skier safety may be affected.
<i>Coordination with Cross-Country Skiing</i>	Would the project affect existing and proposed cross-country skiing in the area?
<i>Snowmobile Usage</i>	What are the effects on snowmobile use of adjacent areas?
<b>Roadless Areas</b> (1)	Portions of the proposed project area are within areas considered for roadless designation
<b>Summer Use</b> (1)	Are summer uses proposed? If so, what would be the effects of this proposal?
	What would be the effects to Trail 538 and horse access?
<b>Traffic and Parking</b> (8)	What would be the effects on traffic and will there be sufficient parking?
	Are there opportunities for alternatives to the private automobile for access to the ski area?
<b>Watershed Resources</b> (6)	What would be the effects on the watershed?
	Would water quality be affected by the proposal?
	What are the possible effects of sedimentation and erosion?
<b>Wetlands</b> (1)	What would be the effects to wetlands?
<b>Wildlife</b> (4)	What would be the effects to wildlife with respect to habitat fragmentation and forested linkage corridors?
	What would be the effects to Threatened, Endangered, and Sensitive wildlife species?
	Would pine marten and wolverine be affected?
<b>Vegetation</b> (1)	What would be the effects to Threatened, Endangered, and Sensitive plant species?
	What would be the effect on areas of old growth?
<b>Visual Quality</b> (1)	What will the project look like upon completion?

# **APPENDIX B – SUMMARY OF PUBLIC COMMENTS ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE BRIDGER BOWL SKI AREA PERMIT RENEWAL AND MASTER DEVELOPMENT PLAN UPDATE**

## **INTRODUCTION**

This report summarizes public responses on the Draft Environmental Impact Statement (DEIS) for the Bridger Bowl Ski Area Permit Renewal and Master Development Plan Update. The DEIS was released for public review and comment on April 26, 1999. Comments were to be received through June 28, 1999. A public information meeting explaining the DEIS was held in Bozeman on May 11, 1999, and those comments are also incorporated into this summary.

Comments were received from 280 individuals, organizations, and government agencies. Written comments arrived in 147 letters or post cards, one e-mail, and one documented phone conversation. Three form letters were identified with 78 signatures. The public meeting contributed 53 respondents. This degree of interest indicates the strong feelings people have in the operation of Bridger Bowl.

This analysis of the public's responses describes what people have said as completely and directly as possible without assigning weights or serving as a vote-count. The system used to analyze comments is objective, reliable, and traceable. All comments received and responses to the DEIS have been considered in the production of this summary.

It is important to note that this analysis is not based on vote-counting. The public involvement efforts of the National Environmental Policy Act (NEPA) are intended to gather information and ideas from the public on proposed actions and alternatives to the Proposed Action to provide a clear basis for choice among options by the decisionmaker and the public. An analysis of this summary of public comments will help the decisionmaker make better decisions, not to simply count pros and cons. Comments are most helpful when they point out inconsistencies or errors, provide additional information pertinent to the analysis, or provide rationale for support of an alternative. The reasons for people's concerns, preferences and criticisms are sought in this process.

Because some respondents address individual alternatives and others address specific issues relating to the analysis, this summary is separated into two sections:

Comments on Alternatives and Comments on Issues.

## **PUBLIC INVOLVEMENT**

Solicitation of Public Comment on the DEIS: A Notice of Intent (NOI) to prepare an EIS was published in the Federal Register on June 13, 1997. A letter was sent, using the Gallatin National Forest mailing list, to federal, state and local government agencies, Native American tribes, and groups or individuals interested in Forest Activities. Numerous newspaper articles and local radio interviews have been prepared and conducted for the project at various times over the past 13 years. Numerous public meetings have also been held to discuss the various past proposals and consultant studies. Specific public involvement actions on this proposal include:

- April 1997 - first appeared in the Gallatin National Forest quarterly project proposal report and every quarter since.
- 6/12/97 - Notice of Comment Opportunity and response form sent for response to proposal and development of issues.
- News articles: Bozeman Chronicle 6-23-91; 10-23-96; 10-24-96; 6-20-97; 6-24-97 and Lone Peak Lookout 9-19-97.
- NOI published in Federal Register 6/13/97
- 6/23/97 Open House at the Bozeman Ranger District
- 4/23/99 mailed draft/summary EIS +100 interested parties.
- 4/27/99 news release that draft was available.
- 5/11/99 open house at Bozeman Ranger District.
- News articles and editorials: Bozeman Daily Chronicle 5/11/99; 5/12/99; 5/19/99; 5/21/99; 6/11/99

Alternatives Analyzed in the DEIS: Four alternatives representing different options were considered in detail. The four alternatives were: Alternative 1: No Action Alternative; Alternative 2: Proposed Action; Alternative 3: Reduced Development in the Slushman Creek Drainage; and Alternative 4: Reduced Development in the South Fork of Brackett Creek Drainage.

## **THE PUBLIC COMMENT ANALYSIS PROCESS**

The analysis method used for this project provides a means of categorizing each person's comments into separate subjects, then grouping like subjects together so that the public's comments can be more thoroughly examined. It accurately displays public concerns and reasoning about particular issues and alternatives since each person's own words and



phrases are captured. It provides a traceable, visible system for displaying comments without injecting interpretation or judgment.

Responses were received in the form of letters or postcards, form letters, a public meeting summary, e-mails, and documented phone conversations. Each letter, postcard, etc. was first given a unique identification number. A coding system was developed to assign demographic information to each respondent and to record their opinions on issues and alternatives. Demographic information included identifying who the respondent represents, the medium used for responding, the respondent's overall preference for or against the proposal to renew the permit and update the master development plan, and where the respondent is from.

- Respondents were classified into one of the following categories, referred to in the coding system as "Organization Types:"
- Individual Citizens, Landowners, Business Operators, Attorneys, Universities, Professional Scientific Organizations
- Federal Agencies, State Government/Agencies, County Government, City/Local government, Indian Tribal Government, Congressional/Legislative Officials, Coalitions
- Industry interests such as Ranching, Timber, Environmental, and Recreation

Substantive comments related to a particular alternative were coded, along with particular reasons (issues) for support of, or opposition to, that alternative. In many instances a particular alternative was not identified, but issues relating to the analysis or ski area expansion in general were addressed. Some people asked for modifications to an alternative, suggested additional alternatives, or asked that previous alternatives be reconsidered; these suggestions were captured as well. All substantive comments, accompanied by the appropriate coding for alternatives and issues, as well as demographic information, were then entered into a computer database for easier sorting and retrieval.

All respondents' values, perceptions, and opinions were captured, including those based on misinformation. The exact words of each respondent were used rather than summaries of the person's words to insure accuracy and objectivity. All letters were read once and coded and then read again by another coder to ensure all issues were highlighted and entered into the data base.

Form letters were grouped to insure that identical coding was used on each letter. Form letters were entered into the database only once; however, the total number of signatures associated with the form letter was recorded to reflect the number of respondents submitting the form letter.

Comments in technical or complex letters were coded and included in the database and were also "red-flagged" because of their length and detail. These letters may then be

analyzed separately by the interdisciplinary team or the decisionmaker. Letters from all government entities have been provided for incorporation into the final Environmental Impact Statement.

A few respondents chose to inform the Forest Service of their opinion more than once. Some spoke at the public meeting and sent a letter; others wrote more than one letter. If multiple letters received from one individual or organization were different, the letters were treated separately.

Any respondent's substantive comments can be found in the database; the original letters and coded copies have been filed in the project file. A cross-reference file lists each respondent alphabetically and by a unique identification number (mail i.d.); thus original letters and coded copies, which are filed numerically, can be located.

The content analysis team consisted of seven people. Six were employees of the Forest Service Northern Regional Office. A neutral team leader was contracted to oversee the content analysis process and write this report. The team leader and a public involvement specialist conducted the coding of the responses; and six individuals assisted with the data entry. The analysis took place in Missoula Montana August 9-13, 1999. The team leader wrote this "Summary of Public Comments" the week of September 20-24 (three days).

## **DEMOGRAPHIC SUMMARY OF RESPONDENTS**

This section presents demographic information of the responses received. Information displayed includes *who* responded (individuals, organizations, agencies, etc.), *how* they responded (letter, meeting comment, etc.), and *where* they generally responded from.

### **WHO RESPONDED**

<b>Organization Type</b>	<b>Number of Signatures</b>
Attorneys (legal)	7
Business Owners/Interests	6
Environmental Interest	6
Federal Agencies/Officials	2
Individual Citizens	244
City/Local Government	1
Landowner	6
Recreational Interest	5
Tribal Government	1
University	2
<b>Total</b>	<b>280</b>

### HOW THEY RESPONDED

Response Type	Number of Signatures
Letter or Post Card	147
E-mail	1
Phone conversation	1
Form letters	78
Public meeting	53
<b>Total</b>	<b>280</b>

### WHERE RESPONDENTS ARE FROM

Location	Number of Signatures
Unknown	3
Belgrade, MT	2
Big Sky, MT	1
Bozeman, MT	233
Calistoga, CA	8
Columbus, MT	1
Denver, CO	1
Helena, MT	1
Livingston, MT	15
Manhattan, MT	1
Missoula, MT	2
Moscow, ID	5
Pablo, MT	1
Pray, MT	1
Suginami-Ky, Tokyo, Japan	1
West Yellowstone, MT	1
Willow Creek, MT	1
Wilsall, MT	2
<b>Total</b>	<b>280</b>

## COMMENTS ON ALTERNATIVES

Public comments on Alternatives 1 through 4 are presented in this portion of the report. Within the discussion of each alternative, text is broken into three sections: comments favoring the alternative, comments against it, and comments suggesting modifications to the alternatives. The majority of comments received on this DEIS were addressing issues rather than alternatives specifically. The comments pertaining to issues are found in the second portion of this summary.

No respondents suggested combining aspects of one alternative with another; however, some recommended entirely different alternatives. Others want previous alternatives reconsidered. These suggestions are provided following the discussions of Alternatives 1 through 4.

In the following discussions on alternatives, representative quotes from respondents' comments are used to illustrate what the majority of people said about particular concerns. In order to protect the integrity of the individuals' responses, the quotes are used exactly as provided, including some syntax mistakes, grammatical errors, and some misinterpretation of the data.

### ALTERNATIVE ONE: NO ACTION ALTERNATIVE

#### COMMENTS FAVORING ALTERNATIVE 1

A handful of respondents say they favor the "no action" alternative. They are concerned with the effects the expansion would have on the back country skiing opportunities and encroachment into the roadless area.

### ALTERNATIVE TWO: PROPOSED ACTION

#### COMMENTS FAVORING ALTERNATIVE 2

The majority of comments received on alternatives were in support of the proposed action. Numerous individuals report they support the proposed action because they believe the expansion of the ski area and terrain is in the best interest of Bridger Bowl, local and visiting skiers, the local economy and the community at large. Many comment that the ski area is well-managed and provides a place they can take their families for an economical ski experience.

Compliance with the Gallatin National Forest Plan: Some respondents feel the Plan already allocated the lands in Slushman Creek for Management Area 2 and this "revisits" a decision already made.

The Bridger Canyon Plan and Zoning Ordinance: Several individuals herald Bridger Canyon as being the first planned and zoned rural area in Montana. They compliment Bridger Bowl management with their efforts to work with the Bridger Canyon people to come up with an ultimate capacity for the ski hill and a way to develop that capacity that is consistent with the overall Canyon Plan.

Backcountry Skiing: Numerous supporters of the proposed action say they support the expansion into more backcountry terrain. Some feel it will provide a space for high density recreation and discourage some people from trespassing into back country areas. On the other hand, some feel an expansion of the terrain by this alternative would facilitate their need to ski beyond the current boundaries.

#### CRITICISMS OF ALTERNATIVE 2

Numerous respondents who are critical of Alternative 2 object to the Bridger Bowl ski area changing from how it is today. They voice concerns with increased traffic, increased ticket prices, and that the local flavor of the area will be changed into a "destination resort" such as Big Sky. Most of the comments in the "issues" portion of this report are directly related to criticisms of this, the proposed action, alternative.

#### SUGGESTED MODIFICATIONS TO ALTERNATIVE 2

Proposed chair lift locations: There were a few respondents who generally support alternative 2, but had some chair lift location concerns and some suggested modifications.

#### **ALTERNATIVE THREE: REDUCED DEVELOPMENT IN SLUSHMAN CREEK DRAINAGE**

Very few comments related to this alternative specifically. One respondent is concerned with any encroachment into the Roadless Area in Alternative 3. This respondent says it is unclear how many acres of the Roadless Area would be impacted.

Several people refer to the Slushman Creek Drainage in their comments; however, unless they specifically attach those comments to an alternative, they are not covered here. Those comments are found in the "issues" section of this report.

#### **ALTERNATIVE FOUR: REDUCED DEVELOPMENT IN THE SOUTH FORK OF BRACKETT CREEK DRAINAGE**

Comments favoring this alternative felt it results in fewer adverse environmental impacts than expansion to the north.

#### **ADDITIONAL ALTERNATIVES SUGGESTED**

Some additional alternatives are suggested by three respondents. They include the addition of an alternative of BBSA improvements within the existing ski area boundaries; specific locations of chairlifts (covered in the issues portion of this report); and an additional alternative for alternate means of transportation such as shuttle buses.

Three respondents want reconsideration of the "Support expansion without lifts" alternative.

## **COMMENTS ON ISSUES**

This section addresses each of the issues identified in the analysis of public comments received on the DEIS. The issues or "concerns" are presented by logical groupings rather than by the numerical code number listed beside it. There were numerous letters in support of the proposal. The positive comments are also reflected in the following summary. The code numbers were assigned during the analysis process as a tool for the content analysis team to categorize comments.

### **100 - DRAFT EIS PROCESS**

Many people question the data used throughout the DEIS. There are many questions asked and comments made about specific items in the document, as well as suggestions for corrections or changes on specific pages. Several individuals request that additional information be incorporated into either the final EIS or request that a second draft EIS be prepared. Specific comments included the following topics:

- Comments on specific data reported
- Writing Style
- Challenges to process and assumptions made
- Additional information needed
- Second draft of the EIS before the final EIS

### **101 - PUBLIC INVOLVEMENT**

### **102 - NEPA COMPLIANCE**

Some respondents feel there was not enough public involvement during the formulation of the DEIS. They claim they did not have an opportunity to comment on the data collected, and the conclusions drawn from the data. They say this precludes meaningful analysis and meaningful public comment. A few say the public is only able to protest that data was not collected and that studies not undertaken in important impacts and social concerns. Some claim a violation of the National Environmental Policy Act in their statements, while others simply claim they want their interest heard. The claims of NEPA violation include inadequate range of alternatives; no discussion of an environmentally preferred alternative; and the need for a second draft EIS because of inadequate analysis. Several respondents refer to the closure of public access at Forest Road 3200 as a direct violation of regulations requiring public notice, comment and studies before permanent closure is permitted. Specific comments included the following topics:

- The need for more public involvement
- National Environmental Policy Act violations
- Closure of Forest Road 3200 at Bridger Bowl
- Incorporate new information into second draft EIS



### **103 - PROJECT PURPOSE AND NEED**

A few respondents take exception with the proposed project's purpose and need. Some feel the discussion for purpose and need does not support all of the actions proposed for this project. The EPA in particular does not object to the expansion of the Bridger Bowl Ski Area, but believes that the purpose and need for ski area expansion beyond existing permit boundaries should be better supported.

### **104 - CONFORMANCE WITH PLANNING AND ZONING**

### **105 - CONFLICTS WITH THE GALLATIN NATIONAL FOREST PLAN**

Several local respondents support Bridger Bowl's expansion as proposed and explain the expansion complies with the Forest Plan and local zoning ordinance. Others stress that the proposal needs to be consistent with the Gallatin County and Bridger Canyon

Zoning Regulations and Land Use Plans and needs to be analyzed in the FEIS.

A few respondents see no reason to change the lands in Slushman Creek to Management Area 2 as they feel that decision was already made in the Forest Plan.

Some individuals feel the project does not comply with the Gallatin National Forest Plan. Most of those comments refer to the need for the South Fork of Brackett Creek to be managed to maintain the lynx, wolverine, Yellowstone cutthroat trout, and white bark pine, and not managed as a ski hill. Another respondent claims the DEIS fails to fully analyze dispersed recreation use (particularly backcountry skiing), and by failing to provide for a wide range of recreational opportunity, the Bridger Bowl DEIS fails to comply with the Forest Plan.

### **200 - EFFECTS OF THE PROPOSAL**

This portion of the report concerns effects of the proposal on issues other than watershed, wildlife, fisheries or socio-economics. Those categories are addressed separately. Several respondents claim the impacts from the Gallatin Land Exchange were not incorporated into the cumulative effects analysis in the DEIS. The question is posed on whether the Gallatin Land Exchange is considered a future or present effect. Others are concerned with inadequate mitigation efforts resulting from the proposed ski area expansion. Several concerns are raised regarding inadequate cumulative effects analysis both direct and indirect and also reasonably foreseeable actions. Indirect effects include growth rate and related effects on air and water and other natural systems, including ecosystems. The majority of the examples regarding cumulative effects are found in the sub-categories of this section (i.e., codes 201 through 215).

## **201 - AIR QUALITY**

## **202 - NOISE POLLUTION**

Three respondents are concerned with the effects of the proposal on air quality. They claim increased traffic will have an effect on the air quality. One respondent is concerned with the current noise and the increased noise that will be generated by the Bridger Bowl expansion.

## **203 - SKIING SAFETY AND PUBLIC SAFETY**

## **204 - LIFT SAFETY**

## **205 - EMERGENCY SERVICES ACCESS**

Several respondents voice concerns about safety with the proposed expansion. Those comments fall into three general categories: safety of skiers on the mountain; safety of people getting to the ski area itself; and safety of the physical layout of the lift and types of lifts. Specific comments included the following topics:

- Skier safety
- Public safety of transportation to the ski area
- Lift Safety
- Emergency Services Access

## **206 - ROAD CONSTRUCTION/ ROAD DENSITY**

## **207 - TRAFFIC AND PARKING**

### Road Construction and Road Density

A few individuals raise the issue of road construction and the impacts of the proposed action on road density. What will be the new road density of the Bridger Bowl area once the expansion is completed?

### Traffic and Parking

Several respondents are concerned with increased traffic and traffic safety. Some feel the DEIS did not analyze traffic safety while acknowledging increased vehicle-related wildlife mortality. Several landowners in the area raise concerns of the adverse impact to Bridger Canyon residents and advocate for a traffic management plan.

Parking is also an issue with some respondents. They are concerned that the expansion of parking facilities was not better described in the DEIS.

## **208 - ROADLESS AREA DEVELOPMENT**

Any development into the roadless area is a big concern of several respondents. The expansion into the Slushman basin to the south is cited as a bad precedent for allowing development into inventoried roadless areas. Many claim the FEIS should include additional information to better support the contention that a current or near future skier demand warrants an expansion beyond the existing permit boundaries. Several request a clear disclosure of roadless area impacts of all alternatives should be provided to facilitate comparative evaluation of roadless area intrusions.

One respondent feels the proposed expansion may actually have a beneficial effect on roadless, back country areas by dispersing recreationists.

## **211 - GROWTH & DEVELOPMENT IN COMBINATION W/ OTHER PROJECTS**

Several respondents feel ski area expansions can promote and hasten adjacent developments to serve the increased numbers of skiers. They feel the positive indirect effects need to be analyzed. They feel growth and development is positive; particularly those who are in businesses related to growth in the ski industry. On the other hand, respondents concerned with the effects of growth in the area call for cumulative effects analysis of this proposal in combination with impacts from surrounding ski areas.

## **212 - VISUAL ENHANCEMENT**

A few people are concerned with visuals and how the ski area expansion will create new openings to the vista views. They are concerned with the new openings created for ski trails, access roads, lift facilities, base area buildings and parking.

## **213 - ACCESS TO PUBLIC LANDS**

Several respondents are concerned with being "locked out of their public lands" and see their rights to access the terrain beyond the ski area boundaries as being violated. On the other hand a few individuals support the policy of no access to lands beyond the boundaries, particularly those who are private landowners.

## **214 - COMFORTABLE CARRYING CAPACITY (CCC)**

Several respondents take exception with the carrying capacity figures in the DEIS. Some feel the carrying capacity has not been reached so there is no need to expand the ski area. Still others feel that the carrying capacity has been exceeded so the ski area expansion is warranted. Some feel the skier capacity can be achieved without expansion beyond existing permit boundaries. A few also feel skier capacity among alternatives should be discussed and clarified in the FEIS.

## **215 - NOXIOUS WEEDS**

A few individuals are concerned the proposed expansion of the ski area will lead to noxious weed disturbances. They claim the Vegetation sections of the DEIS do not indicate if exotic or noxious weed species are found in the analysis area. They recommend the FEIS include a brief description of exotic or noxious weeds.

## **300 - RECREATION AND USER CONFLICT**

### **307 - ADJOINING LANDOWNER OR OTHER LANDOWNER CONFLICT**

Several respondents are concerned the proposed expansion of Bridger Bowl may block access to and result in a loss of potential backcountry skiing terrain. The existing developed Nordic skiing trails operated by the Bohart Ranch was also raised as a concern. Some also claim the required ORV (off-road vehicle) monitoring was not analyzed in the DEIS. One individual is concerned that the escalation in motorized use of the area is leading to a "de facto" motorized area, especially in winter with cross country snowmobile travel. There is also a lot of finger-pointing by both the skiing enthusiasts and the other resource advocates for use of the area. Others claim the Recreation Opportunity Classification (ROS) was not identified in the Draft EIS.

### **301 - LOSS OF BACKCOUNTRY SKIING**

Numerous backcountry skiing advocates are concerned they will not be able to access the terrain beyond the current boundaries. They take offense to references made in the DEIS that they are accessing terrain illegally. They feel they are entitled to access public lands for backcountry skiing. Several skiers say they have used Bradley Meadows and Slushman Drainage for many years. They feel any expansion taken for a new 40-year lease with expanded boundaries north and south must allow backcountry winter use for skiers. They also feel it is a financial burden to some skiers who can't afford to ski at destination resorts.

### **302 - SKIING QUALITY AND QUALITY OF EXPERIENCE**

### **308 - EXPANSION OF SKI AREA BOUNDARIES**

A few respondents comment on their need to maintain their quality of skiing and the experiences they enjoy. Some prefer the Bridger Bowl ski area stay as it is and some support the expansion because they think it would improve their ski experience. Some like to be accountable for their own risk-taking when skiing beyond the boundaries. Quite a few refer to the destination resort of Big Sky and that they do not want to see Bridger Bowl turn into a destination resort.

Several respondents feel the level of increase in skier capacity could be achieved without actually expanding the ski area boundaries. They call for an alternative involving ski area improvements within the existing ski area boundary. A few prefer expansion to the south, if expansion beyond existing boundaries is justified.

### **303 - COORDINATION WITH CROSS-COUNTRY NORDIC SKIING**

The owner-operator of Bohart Cross-Country Ski Center commented on how the proposed expansion would affect Nordic skiing.

### **304 - SNOWMOBILE USAGE**

There were no comments received relating particularly to snowmobile use in the area. Some of the issues pertaining to snowmobiles could be "inferred" from the discussion on off-road vehicle use.

### **305 - DESTINATION RESORT VS. LOCAL SKI AREA**

Numerous respondents refer to the goal of Bridger Bowl and whether or not it should remain a small-town atmosphere, local ski area. Many fear the area will become a destination resort such as Big Sky. Many refer to their personal love of the local family-oriented ski area. Still others are excited about the proposed expansion as it meets the needs of a greater number of the skiing public. Many also are concerned that the reasonable lift ticket prices will disappear, that more novice skiers will have accidents in expert terrain. Many disagree with the purpose and need statement that "to remain competitive with other Montana ski areas, BBSA must improve and expand its facility".

### **306 - CHAIR LIFT LOCATIONS; NEW RUNS PROPOSED; RUNS CHANGED**

Several respondents support the Master Development Plan Update contained in the Draft EIS and feel it addresses the needs for changes at Bridger Bowl. Many of this group have the common complaint there has been no "new terrain" in twenty years. Numerous individuals, on the other hand, see any change as affecting the small-town atmosphere of Bridger Bowl. They feel the uniqueness would be lost, along with the respect and patronage of local skiers. A few respondents request a watershed map to clearly show the drainages in relation to the proposed ski area improvements.

### **400 – WATERSHED**

### **401 - WATER QUALITY**

### **402 - WETLANDS**

A few respondents trust that watershed, water quality and wetland concerns are addressed in the DEIS and any problems would be handled through mitigation, BMP's and well within compliance of Forest Plan standards. Some also feel any effects will be short-term. The majority of respondents commenting on these issues are, however, quite concerned with the treatment of these issues in the DEIS. They are worried about the increases in wastewater pollution loading, an increase in ground water pollution problems, the effects of surge winter-time pollutant loading, and where the treated sewage water will be disposed. They call for more analysis of these effects in the FEIS.

They are also concerned with effects to Bridger Creek, East Gallatin River, Maynard Creek, and the South Fork of Brackett Creek. One respondent points out that the required sewage facility for the Jim Bridger Lodge expansion is not addressed in the DEIS.

Several respondents request that the wetland impacts be clearly disclosed and quantified to facilitate comparative evaluation of alternatives.

## **500 - WILDLIFE**

A few supporters of the proposed expansion for Bridger Bowl hail the ski area management for their consideration of wildlife in the area. They also feel the ski area management protects wildlife by dispersing recreationists. They also claim the people living in the area promote more wildlife populations because they discourage hunting and trapping in the area.

Most of the respondents are concerned with any changes to the wildlife habitat particularly from cutting trees and eliminating wildlife corridors. They point to the possibility of adverse effects to certain wildlife species in addition to threatened, endangered, and sensitive species. They feel increased traffic will increase roadkill and decrease wildlife populations. They also believe increased human activity will lead to wildlife-people conflicts. Another concern is that different animals need different habitat requirements and that the DEIS lumped them all together.

## **501 - THREATENED, ENDANGERED AND SENSITIVE SPECIES**

Several respondents are concerned with the impacts to T&E species. They point out that impacts to T&E species cannot be mitigated as described in the DEIS. They feel the proposed action along with other activities and developments in the area will contribute to species endangerment. They feel the viability of the wolverine and lynx is threatened by habitat fragmentation. Several respondents call for more recreation and ORV monitoring. Some respondents ask for analysis of the white bark pine and its status as a threatened or sensitive species. One respondent could not find any U.S. Fish and Wildlife Service correspondence related to T&E and candidate species in the DEIS. Several request that wildlife surveys be completed prior to the approval of the project. Particular surveys include: Boreal Owl nest trees; white pine blister rust; and habitat suitable for T&E species (lynx hair snags)

## **502 - HABITAT REMOVAL**

## **504 - CONNECTING CORRIDORS, FRAGMENTATION**

Some respondents are supportive of the proposal to expand the ski area; however, they are concerned with the removal of 187 acres of trees. Several are concerned with the adverse environmental impacts to wildlife habitat and the potential destruction of an important watershed through tree removal and road/trail building. Some recommend that areas of high erosion potential or mass failure be identified and disclosed, and that



disturbance to such areas be avoided. Several respondents refer to the removal of white bark pine and old growth forest. They feel it would adversely affect not only the white bark pine itself, but the crucial habitat to several sensitive species.

Several respondents point to the Bridgers as an important connection between wildlife populations in the Greater Yellowstone Ecosystem and the Northern Continental Divide Ecosystem in northwestern Montana. Wide-ranging forest predators use this area as a dispersal or immigration route between other "island" habitats from the Gallatin and Absaroka ranges to the Crazies, Little Belts, Big Belts and northward.

### **503 - MANAGEMENT INDICATOR SPECIES**

Those who comment on the management indicator species for the Gallatin National Forest Plan incorporate those concerns along with their comments on threatened and endangered species. Several call for more surveys for the wolverine (existing dens), boreal owl, flammulated owls, goshawks.

### **600 - FISHERIES**

Several people disagree with the DEIS statement that increased development of the Bridger Bowl Ski Area base area and surrounding area "could affect" fish habitat from increased timber harvest, housing development, and road construction. They question how these effects would not adversely affect fish. They also request more analysis of the snowmaking activities, and whether the total water amount would decrease and if runoff would increase with the increase of man-made snow.

### **601 - SEDIMENT DELIVERY; STREAM CHANNEL INTEGRITY; & ALTERATION OF FLOW REGIMES**

Some people feel the development is a threat to the stream quality of Brackett Creek and other subsidiary creeks so crucial to the health and survival of cutthroat population in the area. They see erosion, sediment increases, and sediment instability as potential problems.

### **602 - YELLOWSTONE CUTTHROAT TROUT**

Several respondents feel the fisheries analysis in the DEIS missed important impacts to resident Yellowstone Cutthroat Trout including: impacts from sewage facilities and an assessment of whether impacts will affect beneficial uses of streams; cumulative effects analysis of private lands development; and effects of wastewater discharges.

### **700 - SOCIAL/ECONOMICS**

Many respondents feel it is past time for the Bridger Bowl Ski Area expansion. Several laud Bridger Bowl as a well-managed ski area. They feel the area provides an excellent recreation area to many families (local and visitors) and tourists. Several individuals

support the expansion because they make their living either at the ski area itself, or see the expansion as directly benefiting their business. They see growth in the area-as exceeding the capacity for the ski area and call for more ski terrain. Numerous people who ski Bridger Bowl want to maintain the local small-town atmosphere of the area. Several support the expansion of the ski area and say they do so for economic reasons. They cite high ticket prices elsewhere and that they don't want to become a destination resort such as Big Sky. On the other hand, a few individuals see ticket prices increasing as the area gets bigger. Some of the individuals who like to ski the backcountry see Bridger Bowl management closing off public access for those who are not paying clients.

A few respondents claim the DEIS violates the Justice In Minority Populations and Low Income Populations Executive Order No. 128898 (Environmental Justice).

### **701 - AMERICANS WITH DISABILITIES ACT**

A few respondents take time to compliment Bridger Bowl's leadership in the challenged skier program, particularly with the organization called Eagle Mount. The Eagle Mount organization says they are very excited about Bridger Bowl's plans for expansion as the new, additional beginners' slopes will give their participants much more terrain on which to practice their skills.

Others have a different viewpoint, however. While they agree it is important to address and solve access to all areas of Bridger Bowl for disabled skiers, access to the ridge should be discouraged for safety reasons.

### **702 - COST OF SKIING TO RECREATIONISTS**

How the proposed expansion would affect the cost of skiing was a big issue with respondents. The comments ran the gamut from Bridger Bowl providing recreation at affordable prices to Bridger Bowl making what is now a family area unaffordable to the average Montanan. Many are unclear how the DEIS addressed lift ticket price increases and how local skiers will be affected by the expansion.

### **703 - EFFECTS ON LOCAL ECONOMY**

Many comment on the positive effects the Bridger Bowl ski area has had on the local economy. They feel the proposed expansion will provide the much needed terrain that will positively influence the local economy. They also feel it is in the best interest of Bridger Bowl to remain competitive and viable.

### **704 - VISITOR USE**

## **705 - TOURISM**

Several respondents commend tourism as a vital industry for the state's economy and that the ski resorts promote tourism in Montana. Some see out of town skiers as having a positive influence on the tourism economy.

## **706 - CULTURAL RESOURCES**

The Confederated Salish and Kootenai Tribes of the Flathead Nation conducted a review of their cultural resource records for the proposed expansion area. They currently have no significant cultural, historical or spiritual-use sites in the area.

A few individuals feel the DEIS is missing numerous historical and cultural factors.

# APPENDIX C – PROPOSED FOREST PLAN AMENDMENTS

## INTRODUCTION

Forest Service requirements for amending forest plans are included in agency regulations and policies. These require that land uses be consistent with forest plans and that proposed activities which would be in conflict with the plan be denied, modified (so as to be consistent), or that the forest plan be amended. Regulations at 36 CFR 219.10(f) direct the Forest Service to consider whether a proposed amendment to a forest plan would be considered a significant change.

The Forest Service is authorized to implement amendments to forest plans in response to changing needs and opportunities, information identified during project analysis, or the results of monitoring and evaluation. The process to consider forest plan amendments, review them for significance, document the results, and reach a decision is contained in the Forest Service Manual (FSM) 1922 and the Forest Service Handbook (FSH) 1909.12, Chapter 5. An assessment of a proposed amendment's significance in the context of the larger forest plan is a crucial part of this process. It is important to note that the definition of significance for amending a forest plan (36 CFR 219.10(f) and FSH 1922.5) is not the same as the definition of significance as defined by the National Environmental Policy Act (NEPA).

The National Forest Management Act (NFMA) requires that proposed forest plan amendments be evaluated for whether they would constitute a significant change in the long-term goods, outputs, and services projected for an entire National Forest. Amendments that are not significant may be adopted following disclosure and notification in an environmental document, such as an EA or an EIS.

The criteria to be examined in an analysis of the significance of a forest plan amendment are detailed in Forest Service Handbook 1909.12, and summarized below. The following discussion uses these parameters to evaluate the significance of adopting the proposed Forest Plan amendments.

1. Timing. When the change in the Forest Plan would take place relative to the planning period and scheduled revisions of the plan.
2. Location and size. Location and size of the area affected compared to the size for the overall planning area.
3. Goals, Objectives, and Outputs. How, or to what degree, the amendment would affect the long-term relationship between levels of goods and services projected by the Forest Plan.
4. Management Prescription. Whether the change would apply only to a specific situation or to future situations across the planning area.

## APPENDIX C-1 – MANAGEMENT AREA DESIGNATIONS

As described in the Forest Plan, the GNF has been divided into 26 management areas, each with different management goals, resource potentials, and limitations. The management area boundaries are not firm lines and do not always follow topographic features. The boundaries represent a transition from one set of opportunities and constraints to another, and they are flexible to assure that the values are protected and to incorporate additional information from project level planning.

The Proposed Action would entail a change in management area designation from MA 12 (with an emphasis on dispersed recreation and big game habitat) to MA 2 (with an emphasis on winter sports areas) in the Bradley Meadows area (217.3 acres). Section 13 was acquired by the Forest Service in 1993 through a land exchange; this area currently has no management area designation. In addition to the conversion from MA 12 to MA 2, approximately 57 acres of currently undesignated lands would also be allocated to MA 2. The remainder of Section 13 would be designated to MA 12 to maintain habitat integrity.

The Forest Plan provides the following definition for MA 12:

*“These management areas provide important habitat for summer or winter wildlife use in a variety of terrain and vegetative cover types. These areas also offer dispersed recreation opportunities.”*

The Forest Plan provides the following definition for MA 2:

*“These areas consist of those portions of the Bridger Bowl and Big Sky ski areas under special use permit. They include ski runs, lift facilities, and lodges. These areas have potential for development or expansion of facilities to meet increasing demand for downhill skiing.”*

The change in management designation would be as a result of incorporating this area into the SUP boundary for Bridger Bowl. It would allow for the expansion of downhill skiing opportunities on the GNF and would result in an enhanced recreation experience.

In conjunction with the SUP adjustment for the inclusion of the gun tower, MA designations along the proposed southeast SUP boundary would also be changed from MA 11 to MA 2 in small parcels to ensure that all lands within the proposed SUP area are designated MA 2. This would result in approximately four acres changing to MA 2. Additionally, approximately 17 acres would be removed from the SUP area and re-designated MA 11 as part of this proposal.

The Forest Plan provides the following definition for MA 11:

*“These areas consist of forested big game habitat. They include productive forest lands that are available for timber harvest, provided that big game habitat objectives are met.”*

No additional impacts would be authorized through this amendment beyond what has been analyzed and disclosed in the SDEIS. The proposed changes to Forest Plan standards at Bridger Bowl would take effect following issuance of a Record of Decision (ROD) for this EIS. Implementation of the approved project elements could potentially commence in the summer or fall of 2004 and could affect areas that might be at issue without the proposed amendment. The area affected through adoption of this amendment comprises approximately 274 acres of land to the north of the existing SUP area.



## APPENDIX C-2 – VISUAL QUALITY OBJECTIVES

The Proposed Action would entail a change in management area designation from 12 to 2 for approximately 217 acres of land in the Bradley Meadows area. As a result, the VQO of *Retention* currently assigned to this area would be changed to *Partial Retention* to reflect management direction for MA 2.

The Visual Management System provides the following definition of Retention:

*“Management activities may not be visually evident. Contrasts in form, line, color, and texture must be reduced during or immediately after the management activity.”*

The proposed amendment would apply only to the proposed expansion to the north of the existing Bridger Bowl SUP area. Within the special use permit area for Bridger Bowl, the VQO for all lands, including Bradley Meadows, is Partial Retention.

The Visual Management System provides the following definition of Partial Retention:

*“Partial Retention requires that any activity must be visually subordinate to the natural characteristics of the landscape. Landscapes with this objective may be modified, but the resulting changes in patterns of vegetation, line, form, color, and texture should not contrast strongly with the adjacent undisturbed landscape.”*

No additional impacts would be authorized through this amendment beyond what has been analyzed and disclosed in the SDEIS.

The proposed changes to Forest Plan standards at Bridger Bowl would take effect following issuance of a ROD for this EIS. Implementation of the approved project elements could potentially commence in the summer or fall of 2004 and could affect areas that might be at issue without the proposed amendment. The area affected through adoption of this amendment comprises approximately 274 acres of land to the north of the existing SUP area.

## APPENDIX C-3 – HABITAT EFFECTIVENESS INDEX FOR ELK

The Forest Plan outlines several forest-wide standards applicable to elk. Specifically, it requires the agency to follow the recommendations in the publication, “Coordinating Elk and Timber Management, Final Report of the Montana Cooperative Elk-Logging Study, 1970-1985” in evaluating the quality of elk habitat. The elk habitat effectiveness index (HEI) is based on open road densities and cover availability. The Forest Plan standard for HEI is applied at the compartment level, since timber compartments are ecological units defined by topographic and hydrologic features, and they generally encompass an area representative of elk summer range. The Forest Plan states that “*effective cover ratings of at least 70 percent will be maintained*” (page II-18).

Implementation of the Proposed Action would occur in timber compartments 504 and 515. Compartment 504 currently has an HEI of 0.54, while compartment 515 currently has an HEI of 0.50. The HEIs for timber compartments 504 and 515 are both below the minimum standard of 0.70 established in the Forest Plan. Road density would increase within the Study Area with implementation of the Proposed Action. This change would further reduce HEI in compartment 504, but it would not affect HEI in compartment 515.

The existing condition in timber compartments 504 and 515 does not meet Forest Plan standards. As a result, an amendment is necessary to allow implementation of the Proposed Action.

The Forest Plan would be amended to say “*given the need for road access to maintain ski area facilities, timber compartments 504 and 515, as affected by development within the Bridger Bowl Special Use Permit boundary, are exempt from the forest-wide HEI standard.*”

The proposed amendment would apply to timber compartments 504 and 515 as they are the only compartments affected by the Proposed Action and this FP amendment is project-specific. The proposed changes to Forest Plan standards at Bridger Bowl would take effect following issuance of a ROD for this EIS. Implementation of the approved project elements could potentially commence in the summer or fall of 2004 and would be inconsistent with the Forest Plan without this proposed amendment.

## APPENDIX C-4 – OLD GROWTH STANDARDS

One forest-wide standard for vegetative diversity states, *“In order to achieve size and age diversity of vegetation, the Forest will strive to develop”* ten percent of the area as old growth *“in timber compartments containing suitable timber.”*

In timber compartment 504, the existing proportion of old growth is currently below the Forest Plan standard of 10 percent; current conditions only display 7.0 percent old growth within the compartment. Implementation of the Proposed Action would further reduce the percentage of old growth within the compartment from seven to 6.95 with construction of the project elements associated with the N-1 Lift and N trails.

The existing condition does not meet Forest Plan standards. As a result, an amendment is necessary to allow implementation of the Proposed Action.

The Forest Plan would be amended to say *“in compartment 504, harvest of old growth will be prohibited on NFS lands outside the Bridger Bowl Special Use Permit boundary.”*

No additional impacts would be authorized through this amendment beyond what has been analyzed and disclosed in the SDEIS.

The proposed amendment would apply only to timber compartment 504 as it would be the only compartment in which old growth is currently below the Forest standard of 10 percent, and will be further reduced with implementation of the Proposed Action. The proposed changes to the Forest Plan would take effect following issuance of a ROD for this EIS. Implementation of the approved project elements could potentially commence in the summer or fall of 2004 and would be inconsistent with the Forest Plan without this proposed amendment.

## **APPENDIX D – IMPLEMENTATION AND MONITORING PLAN**

Mitigation measures specific to this project proposal are included in Chapter 2 of this SDEIS. These are elaborated on in this appendix where further clarification is necessary. These mitigation measures will be incorporated into the project design or included as permit or contract requirements. In addition to these project-specific mitigation measures, all projects on NFS lands in the GNF must also meet Forest Plan standards in order to maintain consistency with Forest Plan direction. Relevant standards for specific resources are outlined below

The Forest Service also has resource-specific Best Management Practices (BMPs) that are designed to lessen impacts on resources or to enhance resource values. Specific watershed resource guidance is found primarily in FSH 2509.22 (Soil and Watershed Conservation Practices) and Watershed Management Guidelines for the GNF (April 1987). The following text is intended to provide guidance to Bridger Bowl and the Forest Service during construction of any approved project elements.

Other regulatory agencies, including but not limited to, the US Army Corps of Engineers, the State of Montana Department of Environmental Quality, and Gallatin County, provide direction that must be followed to obtain necessary permits and certifications and ensure compliance with their regulations.

### **EROSION CONTROL**

Compliance with Montana state requirements for protection of state waters (Administrative Rules of Montana- ARM 16.20.603) means that “land management activities must not generate pollutants in excess of those that are naturally occurring, regardless of condition resulting from runoff or percolation over which man has no control or from developed land where all “reasonable” land, soil, and water conservation practices have been applied. BMPs are reasonable only if beneficial uses are protected and Montana water quality standards are met. BMPs that comply with Montana water quality law have three elements in common: BMPs are applied during implementation, beneficial uses are not impaired, and monitoring is in place to determine whether BMPs function properly.

The area of exposed soils will be minimized at construction sites.

The length and gradient of disturbed areas will be minimized.

Erosion control BMPs will be implemented on all disturbed areas prior, during, and immediately following initial disturbance.

Water bars will be constructed across all disturbed areas at the recommended spacing (see Table D-1). Water bars and surrounding graded areas will be stabilized with seeding, straw, and erosion control blankets as necessary to ensure proper slope stabilization.

**Table D-1**  
**Water Bar Spacing Requirements**

<b>Slope Gradient (%)</b>	<b>Interval (feet)</b>
10	150
15	125
20	100
30	50
40	35
50	30
>50	30

Source: SE Group, 2004

Water bars would be constructed across the hillslope topography of all disturbed slopes after seeding and fertilization. Water bars would be constructed 12-18 inches deep, in a row, by digging a small trench and casting soil material to the downhill side. Each water bar would begin in an undisturbed area of vegetation upslope, traverse across the disturbed area at gradient between five and ten percent, and discharge water into undisturbed vegetation on the lower side of the disturbed area.

Silt fences will be installed along the downslope portion of all disturbed areas and between all waterbodies (including wetlands) and active construction sites.

## **RIPARIAN AREAS AND STREAMBANK PROTECTION**

To minimize adverse effects on riparian areas, all Stream Management Zone (SMZ) provisions of the 1991 Montana Streamside Protection Act and subsequent 1993 rules from the Montana Department of State Lands (MDSL, 1994), and Montana Forestry BMPs (MDSL, 1991) will be followed.

A 310 permit is required from the Gallatin Soil Conservation District for culverts installation in perennial streams. One stream crossing is proposed; the road will cross the stream as close to perpendicular to the stream as possible.

Final design of the proposed stream crossing will minimize impacts to the channel bed and banks. Known areas of slope instability near streams will be avoided. Riprap, boulders, or logs will be placed at potential scour locations to prevent undermining or lateral migration of the stream bank.

No grading, operation of heavy machinery or broadcast burning will occur within the 50 foot SMZ or within identified wetland areas, unless approved as part of the road crossing project. Operation of wheeled or tracked equipment in SMZ will only occur on established roads or when the ground is frozen and/or covered with at least six inches of snow.

Equipment servicing and fueling will not occur within 100 feet of surface water. All petroleum products will be securely stored in leak proof containers. Petroleum waste products will be removed from the site at least weekly.

Fertilizer application will be minimized in SMZs (i.e., road or trail crossings). Manufacturer recommendations will be followed for minimum distances from water.

Herbicides associated with noxious weed control will not contact surface water and must be applied by a competent applicator in strict accordance with label directions and Forest Service requirements.

Stockpiling of soil and construction materials will not occur in SMZs. Log landing and decking areas will also be located out of the SMZs.

A Stormwater Pollution Prevention Plan will be prepared to satisfy conditions of the National Pollution Discharge Elimination System (NPDES) program. Prior to construction, an NPDES permit will be obtained from the EPA.

The amount of vegetation manipulation in sensitive areas such as wetlands, stream environments, and important wildlife habitat features will be minimized.

To the extent possible, avoid placing any heavy machinery in wetlands. If heavy machinery needs to operate on wetland sites with saturated soils or standing water, provide pads (such as plywood) under the machinery that would be capable of supporting it from sinking into the soil surface.

In areas where isolated stump or rock outcrop removal is necessary for construction of ski trails, no excavation would occur in wetlands or riparian areas. Any incidental soil disturbance that occurs during stump and rock removal would be restored to pre-existing conditions by planting with Forest Service approved native seed mix, and then applying erosion control BMPs.

Where tree clearing in wetlands is unavoidable, the shrub component understory will be maintained in order to provide root systems necessary for stability and sediment filtration. Mechanical trimming of shrubs for skier safety would be allowed to the degree that their vigor and survival are maintained.

## **VEGETATION MANAGEMENT AND REVEGETATION**

Machine harvest or ground based yarding of trees will not occur on slopes greater than 35 percent unless the soil is frozen and/or covered by more than six inches of snow.

Ski trail edges will be cut according to the Forest Edge Feathering and Scaloping techniques described in Section 2.4.1 to reduce the strong contrast between ski trails and undisturbed surrounding areas and to minimize wind throw.

Slash will not be disposed of in streams, drainage channels, or wetlands. Any slash created during any summer construction season will be used or disposed of within one year. Disposal would include uses such as soil stabilization structures, chipping, scattering, or burning.



All disturbed areas that have been regraded and re-topsoiled will be revegetated as soon as possible. All grass seed shall be free from noxious weeds. Seed shall be delivered to the site in sealed containers (bags) with the dealer's guaranteed analysis and blue tagged certification.

Minimum revegetation requirements involve seeding with a native grass seed mixture, to be approved by Forest Service for applications on NFS lands. Other plantings of shrubs, brush, or trees may also be required. If non-native species are demonstrated not to be overly aggressive and allow for the establishment of native species, a seed mix containing non-native could be allowed if approved by the Forest Service for applications to NFS lands. Many non-native species have proven to be very effective in the revegetation process. Examples are provided in Table D-2.

**Table D-2**  
**Required Seed Mix and Application Rates**

Common Name	Botanical Name	lbs./acre
Regreen	<i>Agropyron X Triticum</i>	35.0
Pryor slender WG	<i>Agropyron trachycaulum</i>	6.0
Tufted hairgrass*	<i>Deschampsia cespitosa</i>	0.5
Cover Sheep fescue	<i>Festuca ovina</i>	1.5
Alpine bluegrass*	<i>Poa alpina</i>	0.5
Silvery lupine	<i>Lupine argenteus</i>	3.5

\*Must be of North American origin

Native grass mixture will be seeded by broadcast and/or drill seed method. The seed mixes will be applied at optimum rates (i.e., 15-20 lbs/acre and 35-45 lbs/acre, respectively).

The areas to be applied with seed will be prepared for planting by loosening and roughening.

If seed is drilled, planting depths should be specified for each species based on germination requirements.

All revegetated areas on slopes over 30 percent, where mineral soil is exposed, would be fertilized during the application of seed unless specified otherwise. The fertilizer would be uniform in composition, granular, free flowing and suitable for application with approved equipment. Guaranteed analysis by weight of 14 percent nitrogen, 24 percent phosphoric acid, and 14 percent potash is necessary. Application rate would be 200 pounds per acre.

All revegetated areas on slopes over 30 percent, where mineral soil is exposed, would be mulched. Only certified weed-free mulch sources would be utilized. Mulch would be applied at the rate of two tons/acre. Care should be taken to avoid thick (greater than three inches) spots. If hydromulch is utilized, the application rate is 1500 lbs/acre.

## **MONITORING AND MAINTENANCE**

Pre-project surveys will be conducted in and adjacent to areas to be disturbed for any new plant species added to the Forest Service Sensitive Plant Species list after the publication of this document as directed by a Forest Service biologist.

Revegetated areas would be monitored at least every two years by Bridger Bowl until fifth year performance standard is met. Such monitoring should include both qualitative and quantitative approaches to assess the success and prognosis of all runoff and erosion control measures and revegetation efforts. In addition, monitoring should take place after each runoff event. The following are specific items, which should be viewed during monitoring:

- Revegetation establishment success and progress.
- Sheet and rill erosion, gullies, slumping, and subsidence.
- Soundness and effectiveness of erosion control measures.
- Noxious and undesirable weed invasion.
- Degree of herbivory by rodents or rabbits on seed and seedlings.
- Evidence of excessive wildlife grazing.

If performance standards have not been met, then remedial action should be implemented immediately. The following performance standards would be used to determine whether revegetation objectives have been met. Areas that reach fifth year performance standards would not need further monitoring.

### **First Year after Implementation**

Seedling Density - The density and abundance of seedlings is at least three to four seedlings per linear foot of drill row (if drilled) or transect (if broadcast).

Percent Vegetative Cover - Total vegetative cover, including mulch, would be at least 100 percent.

Erosion should be reduced by 75 percent from worst case condition (exposed soil with no protection).

### **Fifth Year after Implementation**

Percent Vegetative Cover - Total vegetative cover would be at least 80 percent of pre-disturbance vegetative cover as measured along a reference transect for establishing baseline conditions.

Dominant Species - 90 percent of the revegetation consist of species included in the seed mix and/or that occurs in the surrounding natural vegetation as measured along the referenced transect for establishing baseline conditions.

Erosion Condition/Soil Surface Factor - Erosion condition of the reclaimed area is at least that for the reference transect for establishing baseline conditions.

Erosion should be reduced by 95 percent from the worst case condition (exposed soil with no protection).